THE IRON TRADE REVIEW

VOLUME XXIV. CLEVELAND, O., SEPTEMBER 17, 1891. NUMBER 38.

THE IRON TRADE REVIEW.

A JOURNAL OF THE
IRON AND STEEL INDUSTRY, THE MACHINERY TRADE AND KINDRED INTERESTS
IS PUBLISHED EVERY THURSDAY BY
THE IRON TRADE REVIEW CO.,
27, 29 *and* 31 *Vincent Street, Cleveland, Ohio.*

TERMS, (strictly in advance):

One year	$3 00
Six months	1 50
Three months	75

Advertising Rates Furnished on Application.

ENTERED AT THE POST OFFICE AT CLEVELAND, O., AS SECOND CLASS MATTER

CLEVELAND, O., SEPTEMBER 17, 1891.

THE WEEK IN IRON CIRCLES.

General Features.

"My impression is that there is going to be considerable activity and improvement in all iron enterprises for a couple of years to come." Thus writes to *The Iron Trade Review* a prominent railroad man, whose large investments, commanding position and dispassionate business judgment, certainly qualify him to speak with authority. In confirmation of this view we have to note that from all quarters encouraging advices are received. Within the past few days there have been speculative inquiries in Central Western markets, and consumers are apparently becoming more interested in the future of the market. The furnaces are acting wisely in accepting orders at full prices for this year's delivery. Large inquiries have been sent out by Western car works, and the day for increased railroad business seems near at hand. A favorable feature of the situation is that in spite of the enormous productive capacity, the stock of pig iron increased very little during August. This shows that consumption is nearly keeping pace with production. Labor troubles in the iron mills seem to have been satisfactorily settled, and there is nothing in sight to interfere with a remunerative business for months to come. A canvass this week of the coke furnaces in the Birmingham district, shows twenty in blast and four out. A fair demand with a hopeful feeling on the part of consumers, is the present condition of the Chicago pig metal market. Small orders are numerous and several ranging in size to 500 tons have marked the past week. There has been no particular change in the way of price either on Northern or Southern metal; a disinclination still continues on the part of furnace men to make contracts at present prices running further ahead than end of present year; for anything beyond January 1st, more money is asked. The increase in production during past 90 days has, however, been so large, that consumers generally feel quite easy, regarding any material change in prices. Lake Superior charcoals are quiet, prices on several of the leading brands being firmly maintained at $18.50 Chicago, with sales ranging up to $19. Some of the smaller companies are still prepared to sell $17.50 iron, but the number is limited. The outlook for balance of the year is healthy, indications being that consumption will steadily advance, and that as soon as railroad lines have any money they will also be large buyers. While there has been no material change in the Detroit market during the week under review, yet there have been a number of transactions in Lake Superior charcoal. While the amount in any single transaction has not been very large, yet in the aggregate the tonnage has been very satisfactory and in no case has the seller been forced to make a concession. The uncertainty of freights remaining as at present is causing sellers to hesitate to contract for future delivery at present figures, and the buyers are not yet ready to stand an advance, and are waiting in hopes that concessions will be offered. Some few orders for coke irons are being placed, and occasionally one for Bessemer. The inquiry for prompt shipment is increasing, and the outlook for larger business is very good. At Louisville, there are inquiries for round lots of both coke and charcoal iron, but furnaces have advanced their views for future delivery, and seem well supplied with orders for thirty to sixty days, and are not disposed to accept orders for long futures at current prices. Buying at Buffalo for the past week has been exceedingly light, but for the first time this year consumers of pig iron report an improved outlook. Outside of this encouraging feature our correspondents fail to see any improvement whatever over the dullness referred to last week. Consumption is evidently on the increase, but the growth is so gradual that it is fully met by orders for carload lots, in addition to the contracts already placed. The most popular brands of Lake Superior charcoal are firm at an advance An improvement in inquiry is noticed at St. Louis. Quite an improvement is to be reported in structural iron during the past two weeks. Contrary to expectation orders have been increasing rapidly and the demand has become quite active. The Pittsburgh mills are now quite busy and are beginning to be pressed to get out orders as quickly as desired. Quite a good many buildings are under construction and many new bridges are also being built. Prices while showing no improvement, are firmer.

The Local Situation.

The increased demand on the part of grain shippers for lake tonnage is responsible for another bull flurry in freights, and the indications seem to point plainly to higher rates—whether permanently is a matter for speculation. Curiously enough, the ore producers find no fault, at this late day, with the higher freight rates, partly because they have by this time practically covered all the ore they will be compelled to bring down this season, and, partly because it will prevent the shipping down of any unsold ore that might be on the ranges. In other words, the scant ore supply that is yet to be brought down will, in their opinion, bring about a reaction, next year, in favor of the ore interests, whereas any surplus that might be brought down would seriously interfere with any such programme. That this calculation is founded upon fact is evidenced by the steady consumption of ore in the region supplied by the Lake Superior country, despite the depression of prices in almost every particular line connected with the iron business. Everybody is looking forward to a betterment, and everybody is hopeful of a speedy realization of this forecast. The furnaces are fairly busy with old orders, and will be for another month or six weeks. The stocks are not accumulating very fast, the increase during August being reported by the Western association as only 5,500 tons, making the total of stocks in the Central West 273,000 gross tons under date of September 10. The sales that are reported are mostly in car lots, and fifty-ton orders, and the quotations are correspondingly depressed. It is difficult, however, to pick up any good-sized lots at the market figure, and not a responsible furnaceman could be found who would engage his product for any considerable time at the present prices. Even if there is no money in the pig iron business under ruling conditions, the furnacemen seem not to have confidence in the future, and the dullness of the market must not be confounded with weakness. Quite a similar condition of affairs prevails in the manufactured iron lines, where bar iron sells freely at $1.60 at the mills, to which ten cents must be added when sold here, out of store. The mills are busy, and the demand is very good, but the price is weak, and will hardly stiffen until some of the output is kept from the glutted market. Sheets are dull, as they have been all the Summer, and the price is as low as ever. Of scrap iron, there seems to be little movement with the exception of old American rails, which command from $22.00 to $22.50. Ths car works, it is said, are about to enter the market, and if they do, the chances are favorable to a revival of business all along the line. The railways, naturally the greatest consumers of iron in various ways, have been very reluctant, this year, to do much in the way of either repairs or new work, and a great deal of the distress now prevailing is directly ascribable to that cause. Metals are strong, and there has been a slight advance. The metal market, generally, is active, and the volume of business is good. The hardware market reports an excellent country trade, and the prospect in that line is good for the most lucrative Fall business on record.

FINANCES OF THE WORLD'S FAIR.

Those persons who were somewhat startled by the announcement that Congress is to be asked for a loan of $5,000,000 in aid of the World's Fair, hardly appreciate the extent to which expenditures are to be made. A recent authoritative estimate puts the amount to be expended by the Exposition Company alone at nearly $18,000,000. This sum does not include what will be expended by the United States and other nations, the States of the Union, cities, industries and private enterprises.

Some idea as to where this vast sum is to go may be obtained by the statement that contracts have been let for the buildings as follows: Administration, $450,000; Manufacturers, $1,000,000; Agriculture, $540,000; Machinery Hall, $1,200,000; Electricity, $375,000; Mines and Mining, $260,000; Transportation, $260,000; Horticulture, $300,000; Fish and Fisheries, $200,000; Woman's Building, $120,000. There remain to be let for all of these buildings, contracts for annexes and roofing, the grand entrances, interior finish and decorations, as well as lighting, plumbing, etc. The Casino and pier will cost $150,000. The Fine Art Palace will cost $500,000, and contracts for these have not yet been let.

The Buildings and Grounds Committee estimates for the completion of the necessary buildings, machinery, decorations, administration, and maintenance up to the date fixed for the opening of the Exposition as follows: Buildings, $7,295,000; grading and filling, $450,000; landscape, $323,490: viaducts and bridges, $125,000; piers, $70,000; waterway improvements, $225,000; water supply and sewerage, $600,000; railways, $500,000; steam plant, $800,000; electricity, $1,500,000; statuary on buildings, $100,000; vases, lamps and posts, $50,000; fuel and light during construction, $20,000; heating, $8,000; making a total of $12,066,890. There has been appropriated for the purposes of the World's Congress Auxiliary, $200,000; landscape, gardening, viaducts, fountains, etc., on the the Lake Front, $200,000; general expense of Construction Department, $500,000; making a grand total of $12,966,890.

The estimates of the Budget committee put the cost of organization and administration at $5,308,563, of which $1,822,790 is for the salaries and expenses of the departments under the control of the Director-General, and $1,485,773 for the expenses of the departments and committees and agents for the Board of Directors. The same estimates for operating expenses, police, fire department, attendants, watchmen, etc., are $1,550,000, making a grand total of $17,825,453.

Verily, the Columbian Exposition is to be a grand and expensive affair.

POPULATION AND IRON CONSUMPTION.

The New York *Tribune* has been making some interesting comparisons as to the iron consumption of Great Britain and the United States, that are worth careful study. We invite the impartial comment of our English contemporaries on these admitted facts:

When this country began protecting its industry in 1861 the British consumption of iron for every inhabitant was nearly three times the consumption in the United States, namely, 172 91 pounds per capita, against 61.44 in this country. Now, after 30 years of Protection here and Free Trade in Great Britain, the consumption of iron in the United States is greater than in Great Britain by about 60 pounds for every inhabitant, so that the excess of consumption in this country over Great Britain is now about as much as the total consumption for each inhabitant in the United States 30 years ago when Protection began. The census of Great Britain has just been taken, showing a slender increase in population for the last ten years, but the increase in quantity of iron consumed has been even smaller. During the last 20 years the consumption for each inhabitant in Great Britain has actually declined 9.15 pounds, while the consumption in the United States for each inhabitant has more than doubled; in 1871 it was 165.58 pounds, and it is now 339.28 pounds.

That the difference between the two countries in the growth of the consumption of iron is due to the extraordinary development of the railway system in the United States, would be the natural supposition; but the fact is shown that during the last year railroad building in this country was at its lowest ebb. The real increase has been in the use of iron for other than railway purposes. Commenting on these facts, the *Tribune* says:

Great Britain sends large quantities of iron to all parts of the world, and a portion of it in manufactured forms, it is true, so that from the manufacturing point of view the consumption of pig iron in the old country is considerably greater than the figures above given herein indicate. But even after deducting only the pig iron exported from Great Britain, the remainder left for manufacturing use in that country last year was nearly $2,000,000 tons less than the quantity consumed in the United States in manufacture. But the true test, as respects the prosperity and welfare of the people, is not the production for shipment to other countries, but the consumption of iron and steel and their various products in maintaining the industries and improving the dwellings and the bridges and the roads of the country.

If the able theorists who advocate Free Trade would only consider these facts—but what is the use asking the average Free Trader to consider facts? They are not in his line.

THE English iron markets are not in a very encouraging condition. Our correspondents, Messrs. S. W. Royse & Co., of Manchester, write under date of August of 29: "The business passing in pig iron continues small, the only satisfaction we can record is that prices have not materially declined since our last report. There is no improved outlook for consumption, or, with the loss attending the production of pig iron at present rates, speculators would come forward and purchase. This state of things may continue for some time longer. There are great complaints for want of orders in the manufactured iron trade, even concessions in price do not bring the wanted orders."

SHEFFIELD cutlers claim that despite the McKinley tariff, their trade in the United States is recovering. A leading manufacturer gives it as his opinion that the continuation of the present tariff would be better than its modification, since more stability would be assured.

"NICKELUM" is the outlandish name given to the new metal (?) discovered by the Pittsburgh wizard. "Emmensite" is the term applied to the new explosive invented by the same party. Where will this thing stop?

Testing Steel Tires.

Steel tires are subjected to three kinds of stress for testing the quality of the metal; tensile resistance of samples cut from ties, flattening ties by hydraulic pressure to the extent of one-sixth or one-seventh of the interior diameter, and submitting sample ties to shocks of a falling body. The first and second, though useful, are incomplete, whereas the trial by shock proves that the tire is capable of active resistance; and in specifying given conditions of deformation, the resisting qualities of the metal are well brought into evidence. Besides that, the shock-proof reveals defects which are not proved in the ordinary trials by tension or by compression. The metal may be rendered brittle by the presence of certain metalloids, though perfectly resisting statical stress. To ascertain the quality of the material of which tires are manufactured, shock-trials must be in relation to the dimensions of the tires. To obtain steel of suitable hardness, the maximum deformation produced by the shock of the fall must be prescribed, also a minimum percentage of carbon. The shock is applied to the tire on edge diametrically. It is deduced from the tabulated results of shock-trials, that the work done on the tire diametrically compressed is independent of the diameter for a given relative deformation, which is taken as one-sixth of the diameter. Again, the work done is proportional to the modulus of flexure of the cross-section. For tires of identical section, but of different diameters, the same relative deformation corresponds to the same fall of the ram; and for tires of different sections shocks proportional to the moduli of flexure caused the same deformations relatively to the diameters. From the results of this experimental investigation, the following tests have been established on the Belgian State railways in contracts for tires: Minimum proportion of carbon, .30 per cent. Shock-trials, first, for tires of locomotives and tenders, three blows of the ram of 6,600 kilogrammetres (47,738 foot-pounds). After the second blow, the reduction of the interior vertical diameter is not to exceed one-seventh of the normal diameter; but this stipulation does not apply to wagon-tires. It is preferred that the test-tires should be selected from the same running. A maximum of 8 per cent. of silicon may be imposed.—[Revue Generale des Chemins de Fer.

Superiority of American Mechanics.

The fact seems to be forcing itself upon our English brothers that American workmen are not only their equals, but in some respects their superiors. A correspondent of the English *Mechanic* acknowledges this in the following paragraph: "English foundries do very well on such plain every-day work as engine beds, planers and shapers; but we cannot get a satisfactory casting of a milling machine frame. As for real complicated castings for typesetters, typewriters and similar automatic machines, we gave up trying to get them here long ago, and order them from Massachusetts. The English excel at heavy work; but at present neither their methods of molding, their sand nor their quality of iron, are fit for fine work. Hollow ware is scarcely to be called fine work, but we have had to import American molders for that work." This from an Englishman, and yet we are told that our workmen are not equal to the "fine skilled workmen" of other countries. Isn't it about time this prating about the superiority of foreign goods and foreign workman ceased, and a little credit be given the American skilled laborers, who are in many ways proving their superiority.—[Manufacturer's Gazette.

Cheapened Fuel-cost in Melting Iron.

At the recent meeting of the American Society of Mechanical Engineers Mr. Webber stated that a considerable saving in the cost of fuel was obtained by melting metal in a foundry cupola rapidly. At the Erie City Iron Works 100 tons of iron were melted per week in an 60-inch cupola at the rate of 8 tons per hour. The ratio of iron to fuel was 7½ to 1. Desiring to increase the capacity of the cupola an attempt was made to melt 12 tons per hour instead of 8. The result was 11½ tons per hour with a ratio of iron to fuel of 9½ to 1, and 75 per cent. of metal went into good castings, or only three-quarters of 1 per cent. less than with the slow rates of melting.

CONDITION OF THE BLAST FURNACES OF THE UNITED STATES

September 1, 1891.

[CONDENSED FROM THE AMERICAN MANUFACTURER.]

LOCATION OF FURNACES.	CHARCOAL.					BITUMINOUS OR COKE.				
	Total No. of Stacks.	In Blast.		Out of Bl'st.		Total No. of Stacks.	In Blast.		Out of Bl'st.	
		No.	Week'y capacity.	No.	Week'y capacity.		No.	Week'y capacity.	No.	Week'y capacity.
New England	13	8	734	5	411	.....	.....	.....	.....	.....
New York	8	2	231	6	798	6	3	3,492	3	2,074
Pennsylvania	14	4	307	10	814	1	0	0	1	600
Upper Susquehanna Valley	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Pittsburgh	.....	.....	.....	.....	.....	25	22	31,135	3	2,911
Spiegel	.....	.....	.....	.....	.....	1	1	1,731	0	0
Allegheny Valley	.....	.....	.....	.....	.....	1	1	770	0	0
Shenango Valley	.....	.....	.....	.....	.....	17	15	11,718	2	761
Youghiogheny Valley	.....	.....	.....	.....	.....	4	2	1,486	2	718
Juniata and Conemaugh Valleys	.....	.....	.....	.....	.....	20	10	7,535	10	2,994
Maryland	8	2	180	6	500	3	1	1,540	2	1,487
Virginia	8	1	54	7	479	14	9	5,475	5	1,663
North Carolina	.....	.....	.....	.....	.....	1	1	100	0	0
West Virginia	2	0	0	2	130	6	2	1,948	4	1,781
Ohio—Mahoning Valley	.....	.....	.....	.....	.....	15	11	9,733	4	3,836
Eastern, Central and Northern	.....	.....	.....	.....	.....	17	12	8,955	5	3,306
Hocking Valley	.....	.....	.....	.....	.....	14	4	1,306	10	2,668
Hanging Rock	12	9	783	3	275	13	9	1,645	4	1,098
Miscellaneous	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Kentucky	1	1	104	0	0	5	3	847	2	720
Hanging Rock	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Western Region and Miscellan'ous	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Tennessee	6	4	1,222	2	160	13	10	4,926	3	1,276
Georgia	4	3	617	1	98	2	1	693	1	675
Alabama	14	6	1,575	8	1,730	38	21	13,826	17	10,849
Indiana	.....	.....	.....	.....	.....	2	1	163	1	278
Illinois	.....	.....	.....	.....	.....	18	14	17,122	4	4,550
Spiegel	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Michigan	23	11	3,738	12	3,561	.....	.....	.....	.....	.....
Wisconsin	5	4	1,839	1	120	4	3	2,378	1	422
Minnesota	.....	.....	.....	.....	.....	1	0	0	1	140
Missouri	2	1	273	1	315	5	1	615	4	3,149
Texas	3	3	748	0	0	.....	.....	.....	.....	.....
Oregon	1	1	270	0	0	.....	.....	.....	.....	.....
Colorado	.....	.....	.....	.....	.....	2	1	354	1	354
Utah	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Washington	1	0	0	1	205	.....	.....	.....	.....	.....
Total charcoal and coke	125	60	12,675	65	9,596	248	158	129,493	90	48,170
Total anthracite	157	84	32,338	73	24,501	.....	.....	.....	.....	.....

SUMMARY.

FUEL.	IN BLAST.						OUT OF BLAST.			
	Number.			Weekly Capacity.			Number.		Weekly Capacity.	
		Month Previous.	Year Previous.		Month Previous.	Year Previous.		Month Previous.		Month Previous.
Charcoal	60	53	67	12,675	11,184	13,133	65	73	9,596	11,031
Anthracite	84	90	103	32,338	35,286	39,689	73	67	24,501	23,056
Bituminous	158	159	157	129,493	128,032	114,411	90	91	48,170	48,324
Total	302	302	327	174,506	174,502	167,233	228	231	82,267	82,411

THE IRON AND STEEL TRADE OF RUSSIA.*

In the year of 1888 there were extracted 1,433,513 tons of iron ore, of which 1,389,533 tons were from 612 mines and 43,980 tons from 149 lakes. Compared with 1887, the extraction was greater by 78,020 tons.

The number of works producing pig in 1888 was 132, with 200 blast furnaces. During the year 1,351,997 tons of ore were smelted, of which about 300,000 tons were magnetic iron and hematite, 704,000 tons of brown hematite, 271,000 tons of various kinds of ore, and 70,000 tons of scoria, etc. The production of pig was 665,923 tons, of which more than three-fourths, or 509,151 tons, were obtained by wood charcoal, one-fifth, or 135,424 tons, by coke, and 22,348 tons, or about 3 per cent., by mixed fuel. The Ural takes the first place in the manufacture of pig. The production of its blast furnaces far exceeds that of all the works of the other districts of the empire. In 1888 it amounted to 393,762 tons, of which 55,533 tons were for the State works and 338,229 for private manufacturers.

The establishments which have reached the highest figures in 1888 are, in the first rank, the Nouvelle Russie Co., in the government of Catherinslav, whose two blast furnaces in which the ore is treated with coke, produced 56,485 tons of pig; that of the Huta-Bankowa Co., in the government of Piotrkow, with two coke blast furnaces, producing 26,592 tons. Then follow eight other works using wood charcoal, and which produced each from 11,000 to 16,000 tons.

Compared with 1887, the production of pig augmented in 1888 by 54,054 tons or nearly 9 per cent.; outside of north of Siberia, where this industry is not much developed, the augmentation has been general; it was greatest in the basin of the Vistula and in the South.

In districts where the blast furnaces work with wood charcoal, the metallurgical industry can only increase its production in limited proportions by the difficulty of augmenting its charcoal resources. In others where mineral fuel is employed—that is to say, in the South and in the governments of the kingdom of Poland—its development is much more rapid. The progress realized in the regions of the South in 1888, is principally owing to the opening of the works of the Briansk Co. at the close of 1887, and to an increase of 16,380 tons in the production of the blast furnaces of the Nouvelle Russie Co. In 1889 the Dnieper Metallurgical Co. set in activity its powerful Kamensk works and the production of these three establishments reached during that year nearly 131,040 tons of pig, being an increase of 62 per cent. over 1888.

The increase in the production of pig during the last ten years (from 1879 to 1888) amounted to 234,034 tons, or 54 per cent. Up to 1886 it was very slow and amounted only to 98,280 tons, while from 1886 to 1888 the progress exceeded 131,040 tons. In the provinces of the South and Southwest the production quintupled; in the kingdom of Poland it tripled; in the Moscow basin it increased by 41 per cent., and in the Ural by 26 per cent.

With reference to iron, the works were 173 in number in 1888, and they manufactured 354,558 tons of merchant iron. The production was, therefore, taken as a whole, almost the same as in 1887, as it showed only an insignificant diminution of 4,857 tons. But taken in districts, the results of the two years show very great differences when compared. In the kingdom of Poland, the manufacture diminished by 8,502 tons, or 14 per cent., falling from 63,642 tons to 55,140 tons, and in the North it fell 7,737 tons, or 23 per cent., descending from 33,070 tons to 26,233 tons. In all other districts a more or less notable increase is to be reported. The largest proportionate increase—30 per cent.—is reported from the Center and the Southwest, where production advanced from 13,016 tons in 1887 to 16,396 tons in 1888, or a difference of 3,380 tons. The mines of the Moscow basin raised their production from 30,218 tons in 1887 to 36,614 tons in 1888; the increase is 6,396 tons, or 21 per cent. The Ural district furnishes 218,837 tons in 1888, as compared with 217,893 tons in 1887, or an augmentation of 944 tons. Siberia increased its production by 502 tons, and Finland by 659 tons. The manufacture of iron has only progressed slowly from 1879 to 1888.

The manufacture of steel, like that of iron, has not advanced during 1888, and shows a certain reduction as compared with the preceding year. From 225,479 tons in 1887 it fell in 1888 to only 222,288 tons—that is to say, a diminution of 3,191 tons. The production diminishes by 6,666 tons, or 11 per cent., for the steel works of the North, by 1,365 tons, or 3 per cent., for those of the center, and by 764 tons, or more than 37 per cent, for those of Finland, where the manufacture is of little importance. It increased about 8 per cent., or 2,949 tons, in the Moscow basin, and about 3 per cent. in the Vistula basin (1,456 tons), and by 1,193 tons in the Ural district. In the first of these three last-named districts the augmentation refers in a general manner to all the works, while in the second it proceeds from the development of the steel works of the Huta-Bankowa Co., which has increased the production by 3,783 tons.

From 1879 to 1888, the manufacture of steel has sustained material fluctuations, without marking any regular progress. The following are the figures:

Years	Tons.	Years.	Tons.
1879	210,004	1884	206,964
1880	307,397	1885	192,895
1881	293,323	1886	251,618
1882	247,669	1887	225,479
1883	221,883	1888	222,288

Of the 222,288 tons of steel produced in 1888, 1,946 tons were manufactured by cementation, 2,386 tons by puddling, 51,189 tons by the Martin-Siemens process, and 4,262 tons by fusion in the crucible. The quanlity of steel rails manufactured was 63,029 tons. The number of steel works was 32.

* Translated specially for the *Colliery Guardian* from *La Metallurgie*.

A Substitute For Natural Gas.

Glass manufacturers have been bewailing the increasing cost and decreasing quantity of natural gas more loudly, perhaps, than any other people, as the advantages of gas over coal as a heat producer probably had a greater influence on the glass business than on any other. But necessity, the mother of invention, has brought forth a substitute that will not only take the place of natural gas as to effectiveness and general results, but will greatly lessen the cost of production. It has been known for some time that secret experiments and tests of some kind were being conducted at the flint glass works of Bryce & Higbee, at Homestead. It was learned yesterday that M. L. Murphy, the furnace builder, had perfected a glass furnace in which gas produced from coal is consumed, and the volume and steadiness of heat maintained is equal that secured by the use of natural gas. The furnace consists of a deep well or eye, having on either side two or more producers connected with a central eye by channels, the construction of which impart to the gas which is admitted through them a spiral or swirling motion as it ascends toward the top of the eye. Some distance below the top of the eye, the gas comes in contact with heated air admitted through openings on the side walls of the producer and heated by the waste heat of the same. The temperature at this point is about 1,400°.

Mr. Higbee was asked yesterday what the result of the tests had been. He stated that they were very satisfactory and that his firm would adopt this process throughout its entire plant. He said it was also being introduced at the works of Richard Hartley, of Tarentum, and the Braddock Glass Co. The test was made on a 13-pot furnace; the cost for operating this, with natural gas, at the rate of $70 a pot a month, would be $910 per month, while the cost by the new process, allowing 3 cents a bushel for coal, was found to be a little less than $300 a month—a saving of $500 a month on a 13-pot furnace. "This," said Mr. Higbee, "is certainly a big thing." The patent which Mr. Murphy has applied for through his attorney, J. H. Roney, has been approved.—[Pittsburgh Dispatch.

Restoring Burnt Steel.

By frequent heating steel loses its carbon and comes therefore nearer to iron in quality; it is then said to be burnt. According to a German paper the steel qualities of the metal may be restored by repeated heating to redness and immersion in hot water. Burnt cast steel may be restored in the following manner: Melt three parts by weight of good and pure colophony in a crucible, the mass to be slowly and continuously stirred, and then add, while stirring, two parts of boiled linseed oil, taking care that the mixture does not catch fire. The product, a brown viscid mass, will, it is stated, render burnt cast steel better than it was in the original state if the metal be heated to incandescence and repeatedly immersed in the mixture.

TAKE the Nickel Plate Saturday night Niagara Falls excursion, via Nickel Plate. Ask agents.

OUR TARIFF FOR CANADA.

Our esteemed contemporary, the Toronto *Globe*, appears to think it necessary to attack the American system of Protection in order to enforce its attacks upon the Canadian system as embodied in Sir John MacDonald's so-called National Policy. In this, as we think, the *Globe* makes a serious mistake. It misleads its readers and exercises an influence which tends to retard rather than promote free trade with Canada. Methods of customs taxation are matters of policy. What may be meat for one country may be poison for another. The arguments that sustain Protection here, where we have every variety of soil and climate, and where, as a first-class nation, we cannot afford to depend on foreigners for any article necessary to our subsistance and independence that we can ourselves produce, do not apply to Canada. The United States are a natural union and they cover a continent, and with free trade among themselves their people can grow in prosperity with small regard to what goes on beyond the oceans that bound their shores. It does not follow that a foreign trade is undesirable, but experience has abundantly shown that the industrial policy is wisest for them which, while opening their ports widely and freely to all those foreign products that they do not and can not themselves create, holds in check such importations as compete with their own productions.

The situation in Canada is different. It is not a natural union. It is a political league of communities widely separated by intervening deserts, and the natural avenues of exchange for each community are invariably to the south and not to the east and west. They are small communities. They have but one climate, and their natural range of production is narrow. To them the policy of Protection is an attempt to make four geographical divisions of country with substantially the same climate and resources prosper by tradiug with one another in the things of which each produces a surplus. No wonder it has failed. The policy of Protection to us is an entirely different matter, and the *Globe* will be a long time opening our markets to Canadian goods unless it contrives to appreciate that circumstance. How different it is, finds demonstration in the fact that while Canada has been gaining 498,534 people, we have gained 12,466,467; while the Maritime Provinces and the Upper St. Lawrence country have remained practically stationary in people and wealth, New England and New York, of which they are northern extensions, have increased enormously in both; while Canada, at an expense of $3,000,000, has secured 800,000 immigrants, the most of whom have escaped into this country, we have received, without expense and in the face of restrictive laws, 7,000,000; and while we have developed our country with a comparatively small public expense and paid off a thousand millions of debt, Canada has added $100,000,000 to her debt with no substantial returns, and has contributed fully a million of her most progressive citizens to our population.

Now comes the point. The *Globe* and the *Tribune* both favor Free Trade between Canada and the United States—the *Globe* passionately, the *Tribune* indifferently; and the difference in the degree of our respective dispositions on this subject illustrates the sad fact in human nature that what men want from a selfish motive they want a vast deal more than what they want from a motive of mere benevolence and friendship. The *Globe* favors Free Trade in order that the Canadians may obtain, as Mr. Blake expressed it, "men, money and markets"; or, in other words, in order that they may keep at home the 100,000 Canadians who are coming over here every year to add to our wealth; that they may obtain a portion of the immigration which is now flowing into our factories and fields; that they may secure a part of the capital that is now occupied in our forests, our mines, our farms and our manufactories, and that they may sell their produce in our markets. But what are we to get from such a bargain? How will it further our interests to build up Montreal, Halifax, Toronto, Winnipeg and Victoria, to divert our capital there, and to receive in our markets a large supply of just that kind of produce of which we have already a surplus? Obviously, it will not further them at all. The net result will be a loss. We can afford the loss. We shall be glad to afford it. We like and admire the Canadians, and whatever may be their flag or form of government, we are glad to see them prosper. But our desires in this respect are not intense enough to dispose us to abandon or modify our industrial system simply for their advantage, nor can we suppose that they would ask or expect us to give them a better bargain as a British dependency than we should give were they coming bodily into our Union. If they did that they would get all that we give ourselves, the great and useful McKinley Tariff included. Perhaps we may be willing to give them all this under existing circumstances, and if so, when they take their next census The *Globe* will find the difference between the results of Protection applied to a continent and to a string of disconnected communities. Of this it may be assured: the McKinley Tariff has come here to stay, and the only Reciprocity which will be adopted between the United States and Canada will be that which carries its provisions from the Gulf of Mexico to the Arctic sea.—[New York Tribune.

A GREAT PIPE WORKS ENTEPRISE.

On May 28th, 1891, the Radford Pipe & Foundry Co., of Radford, Va., made a lease for a term of years of the pipe works at Anniston, Ala., with the privilege of purchase of same. This property consists of some forty-five acres of land on which are erected in all some ten to fifteen buildings, among which are the offices, pipe foundry, machine foundry, machine shop, pattern shop, cleaning sheds, engine and boiler house, pump house, stables, storage sheds, etc. There is not any blast furnace as a part of this property, but one owned and run by other parties from whom the pipe works company obtain their pig iron at a price less than if they should build a furnace and make it themselves. On this property are tracks leading to all parts of the same so far as needed for bringing in coal and any other articles necessary in their business. The works are well supplied with all kinds of heavy cranes for conveying coal and pig iron to the furnaces. Railroad tracks from the East Tennessee, Virginia & Georgia, Louisville & Nashville and other lines come in on their property, and give them good facilities for shipping promptly to all sections of the country. The product of the works is some 200 tons of pipe a day, and when the works in Radford, Va., are completed and in good working order, which will be in a few weeks, this company from their two plants will be able to turn out some 350 tons of pipe a day, and if needed, by working extra time may be enabled to turn out some 400 tons of pipe a day, being prepared to receive and fill all orders large or small with all desired promptness. This company's plant in Radford, Va., is not yet entirely completed as to their pipe works part of the same, but they hope to have it done in about six weeks. They have been doing quite a large business for some time in the foundry department. The demand for iron pipe is now very good, and will probably continue so for the rest of this year, and there has been an advance in price on the same of $1.00 to $1.50 per ton.

The Radford Pipe & Foundry Co. have the following contracts on their books, making a very good showing for them at this time: Denver, Col., 1,000 tons; Norton, Va., 400 tons; Roanoke, Va., 300 tons; Indianapolis, Ind., 200 tons; Anderson, Ind., 300 tons; Spokane Falls, Washington, 2,000 tons, making in all 5,200 tons. These, with other orders in prospect, will keep both plants running to their full capacity when the Radford plant is completed. We wish to call attention to the order from Spokane Falls. When it is considered that there are pipe works much nearer that city, it must be a source of much gratification to the Radford Pipe & Foundry Co. to secure this large contract.

J. P. G.

A LOCOMOTIVE OF GREAT SPEED.

"If the new engine I am about to have constructed is not capable of making 100 miles an hour, I'll give her away to the first person I meet."

This astounding statement was made yesterday by Mr. Jackson Richards, the master mechanic of the Philadelphia & Reading Railroad, who was exhibiting to a party of deeply interested persons the drawings for a locomotive which, if successful, is almost sure to revolutionize the construction of the high speed locomotives of the future. Mr. Richards, who is recognized all over the United States as having no peer in knowledge concerning locomotives and railroad machinery, has been working on his latest invention for the past ten years, and a few days ago the drawings were completed and the patent was applied for.

The new invention will enable a gigantic stride to be taken in the matter of high-speed locomotives, and, if the new flyer is as successful as experts predict she will be, it is more than likely that the time between Philadelphia and New York will be made in less than an hour. A specimen engine will be built for exhibition at the World's Fair, and the trial trip will be made between here and that city.

In outward appearance the new locomotive will not differ materially from the speedy engine now used on the Philadelphia & Reading Railroad between this city and New York. The peculiarity of construction lies in the fact that instead of two cylinders as used at present, there will be four. One cylinder will be located on each side of the locomotive frame as at present, and the other two will be cast in what is known as the cylinder saddle. The inside pair of cylinders are to be in one piece, and will lie on an angle. The outside cylinders are to be horizontal as at present. The four cylinders will entirely overcome what is known to engineers as the dead center, and the engine will be perfectly balanced without any counter-balance in the wheels. This latter improvement will, to a large degree, do away with the vicious pounding which has proven so destructive to modern road beds. The perfect balancing of the engine will be largely due to the working of the two cylinders so near her center, and these same cylinders, working as they do, from such a central point of vantage will help out in the matter of speed to a great degree.

According to the experts who have examined the drawings, the valve motion is perfect. There will be four valves—one to each cylinder—and they will be operated by two links, the same as now used for two cylinders. The engine is designed to be built on the Wooton fire-box, the same as is now used on the famous "206," which made a mile in the remarkable time of 39 4-5 seconds on August 27. The ordinary speed of the destined world-beater would be 85 miles an hour.—[Philadelphia Record.

Electrical Appliances in a Rolling Mill.

There is now in use in the South Chicago mills of the Illinois Steel Co., two electrical appliances which are of considerable interest. One is an automatic recording apparatus by which the number of rails rolled is duly recorded. The recording instrument itself is a very simple counter, but the manner by which it is actuated is very interesting, especially when it is remembered that this end of the apparatus must be in close proximity to a hot rail. The conditions under which it operates are therefore very severe. As the rails pass from the saws they strike a small lever which is thereby moved out of its normal position, and this actuates a contact piece within a case which thoroughly protects the apparatus from the heat and moisture. The electric circuit is carried from this contact mechanism to the recording instrument, and in this way the record can be easily read at any time. The other apparatus is a printing telegraph system by which men at the reheating pits can inform those at the finishing end of the mill as to the heat numbers of the ingot, the ingot numbers, the number of rails to each ingot, so that the proper number may be stamped upon each rail that leaves the mill. In addition to these numbers the "pit" and "hole" numbers are also despatched. This mechanism is, of course, somewhat complicated, but it has done its work very satisfactorily. The transmitter is in charge of one of the men at the reheating pit, and the receiving instrument is in charge of a boy who reports on a blackboard for the use of the stamper the numbers and letters as they are printed on the tape by the receiving instrument. The distance between the two is about 350 feet.—[Railway Review.

LAKE SUPERIOR MINING NOTES.

The Dunn mine will ship about 175,000 tons this season.—[Iron Ore, Ishpeming.

The diamond drill operated at the Dexter property by M. E. Harrington & Son, Ishpeming, has cut about 50 feet of low-grade ore, sufficient to warrant further borings, which will be made to cut ground still deeper than any yet tested.—[Iron Ore, Ishpeming.

At the south side exploration of the Winthrop they have commenced the third level, this being at a depth of 250 feet. The showing at this point is encouraging. On the second level considerable ore of merchantable grade has been encountered, and it is expected that the level just begun will reveal a good deposit. At No. 4, old mine, the new find continues to hold out, and it is looked upon as an addition of great value.—[Iron Ore, Ishpeming.

Last week we mentioned the fact that a new and important ore discovery had been made still further east, between Clarksburg and Greenwood. This, of course, only gives additional importance to this field. But people must not expect that mere testpitting will uncover ore along this neighborhood. Testpits will be apt to strike quartzite, and the ore lies under the quartzite, where man must get or abandon the field. The importance of borings of this character to the entire Marquette range will at once be seen by those at all acquainted with the Lake Superior basin.—[Lake Superior Democrat.

In a recent interview with a reporter of the Marinette *Eagle*, President Ingersoll, of the Buckeye, reported great developments in the company's old workings and the new find. In the first one, he said, a shaft has been sunk to a depth of 90 feet, from which a crosscut has been made 45 feet to the north and 65 feet to the south in a vein 195 feet wide, without striking the foot wall. On Monday the shaft was sunk 60 feet deeper to another level. About 200 feet west of this shaft will also be sunk a new one to test the width of this vein. The new find is 40 rods north of the first one, and at a depth of twelve feet from the surface a fine bed of ore struck containing 60 per cent. of metallic iron of most excellent quality. A shaft is being sunk and run down several feet in ore. Other testpits will be sunk to test the length and breadth of the new find. They have a stockpile of 1,000 tons, and are pushing explorations rapidly. There is now no longer any doubt that the Buckeye is going to be among the best upon the range, a fact which will be very gratifying to the Marinette stockholders. The following now composed the officers of the Buckeye Mining Co.: President, D. W. Ingersoll, Marinette; Vice-President, T. F. Rhoda, Milwaukee; Secretary and Treasurer, Col. E. C. Eastman, Marinette; Superintendent, Capt. H. G. Fisk, Iron Mountain; Directors, Maj Ed. Scofield, C. O. Josslyn, Col. E, Eastman, D. W. Ingersoll, R. H. Hackett, Marinette, and T. D. Rhoda, Milwaukee.—[Florence Mining News.

The Lee mine is putting out the best quality of ore since it was first opened up, but the grain is gradually narrowing down, although it would not be surprising if another lens of ore was found beneath the formation now being worked. The mine is now 205 feet deep and another stope is being made. A diamond drill has recently finished crosscutting the formation about 100 feet west of the Lee, but nothing encouraging was found, and the drill has been moved about 600 feet further west, where another hole will be sunk.—[Iron Journal, Tower, Minn.

A most excellent showing—one of the best on the Mesaba—has been made on section 3, 58 16 by the Biwabic Iron Co. The first shaft was sunk 16 feet before striking ore and has now penetrated it a depth of 45 feet. Other pits have been sunk about the 40 covering an area 350x500 feet and nearly all are bottomed in ore, an assay of which has given 61 per cent. The fee simple is owned by J. M. Williams, of Chicago, and John McKinley, of Duluth, was paid $30,000 for his lease of the same. The ore runs about the same in grade and appearance as that of the Merritt mine in 58-18, 12 miles west.—[Iron Journal, Tower, Minn.

At the Mastodon, about 25,000 tons have been shipped and considerable more than 10,000 tons remains in stock. Mining is not being vigorously pushed and it is possible to greatly increase the present daily output.—[Diamond Drill, Crystal Falls.

At the Paint River, shipping goes on very steadily, and something more than 35,000 tons has been sent out, and the stockpiles still contain several thousand of tons. Some exploratory work is also being done.—[Diamond Drill, Crystall Falls.

At the Ludington mine about 600 tons of ore is hoisted daily. The stockpiles were exhausted some time ago so that the shipments cannot exceed the amount that is raised.—[Iron Range.

Economy in Boiler Practice.

Owing to the rapidly decreasing supply of gas for manufacturing purposes, it is becoming necessary for most manufacturers in the Pittsburgh district to burn coal under their boilers. Few people have any idea of the immense amount of fuel consumed in boiler practice. The amount of heat necessary to evaporate one pound of water into steam would melt three pounds of steel. Therefore, 100 H. P. in boilers will use, every hour, the same amount of gas that is necessary to melt five tons of steel. The annoyance of handling coal, the difficulty of obtaining good firemen and the smoke are overcome by automatic stokers and coal handling machinery. Seven thousand and five hundred horse-power Babcock & Wilcox boilers at the Spreckel's Sugar Refinery, Philadelphia, burn bitumious "run-of-mine" coal, and neither the coal or ashes is touched by hand. Upon this subject a recent circular letter from the Babcock & Wilcox Co. says:

"Every 100 H. P. of boilers you are using with natural gas are consuming as a minimum, 200,000 cubic feet of gas every 24 hours. One of our best customers in this district (The Cambria Iron Co., Johnstown) are already going back to the use of coal and automatic stokers for their boilers, preferring to use what gas they can get for their puddling and heating furnaces, where it is of real value.

"The old-fashioned two-flue boilers generally used in this district are extravagant in fuel almost beyond belief. Even in careful practice two-flue boilers will consume about 50 per cent. more fuel than our boilers. As an instance of what this means we will cite the case of the Oliver & Roberts Wire Co., who find that for every horse-power of our boilers that they have in use they save about one bushel of coal every 24 hours over that used by two-flue boilers. This means, even at the exceedingly low price that slack can be purchased in this district, a saving of about $10 per year on every horse-power of boilers you have in your plant. At this rate a plant of our boilers would pay for themselves completely in about two years, and would continue thereafter paying a 50 per cent. dividend on themselves for the next 40 or 50 years.

THE CYCLONE CORN SHELLER.

Having felt the need of a more perfect and effective sheller than had ever been introduced, the Garry Iron & Steel Roofing Co., Cleveland, have brought out the Cyclone, which they are sure will meet all requirements. They have succeeded in overcoming the frequent clogging and choking which is the constant objection to other machines in the market, and have now a machine which will please the trade. They have been very particular to make every part strong enough to stand all strains that it would be likely to have, but if by some misuse any part should be broken it can easily be repaired at a slight expense, as all parts are made in duplicate and kept in stock. Attention is called to the manner in which the tension of the spring is adjusted. It is simple and can easily be adjusted to any size ears desired.

Tasmanian Iron Ores.

Referring to the article which appeared in our last issue under the above heading, we have since learned that a sample of the iron ore, from the property of Messrs. Henry Law & Co., near the Blythe River (Tasmania), weighing about 4 cwt. and forwarded to Messrs. Parke & Lacy Co., of Sidney, and that they took this raw ore, and employing an ordinary blast furnace produced first-class castings, samples of which are now in our office, and can be examined by those interested. This production of merchantable castings direct from raw ore, is certainly a step in the right direction towards the development of our iron mining districts. Messrs. Parke & Lacy Co. show samples of puddle bar iron, wrought iron, pig iron and castings, all produced out of this 4 cwt. of raw ore.

The experiment was conducted at Haliday's engine works, 20 Erskin St., Sidney, by Mr. W. Brazenall, who holds a certificate of merit from the commissioners of the London Exhibition, 1889. Mr. Brazenall informs us that he charged an ordinary foundry furnace with ¾ cwt. of the Tasmanian iron ore, and about 14 lbs. of limestone, and ran the iron smelted into pigs. He afterwards made castings of various descriptions from the pigs thus produced, and had a cast mandril put into the lathe to show that the iron was not too hard for machining. The iron proved of the very highest quality of exceedingly fine and close grain and very tough. In addition to the cast iron, a small quantity of puddle bar iron was secured, owing to the furnace not being entirely adapted for producing cast iron, and wrought iron has been worked up with the most satisfactory results. Mr. Brazenall, who has had large experience in the manufacture of iron, and Mr. Haliday, both speak in enthusiastic terms of the quality of the iron.—[Australasian Mining Standard.

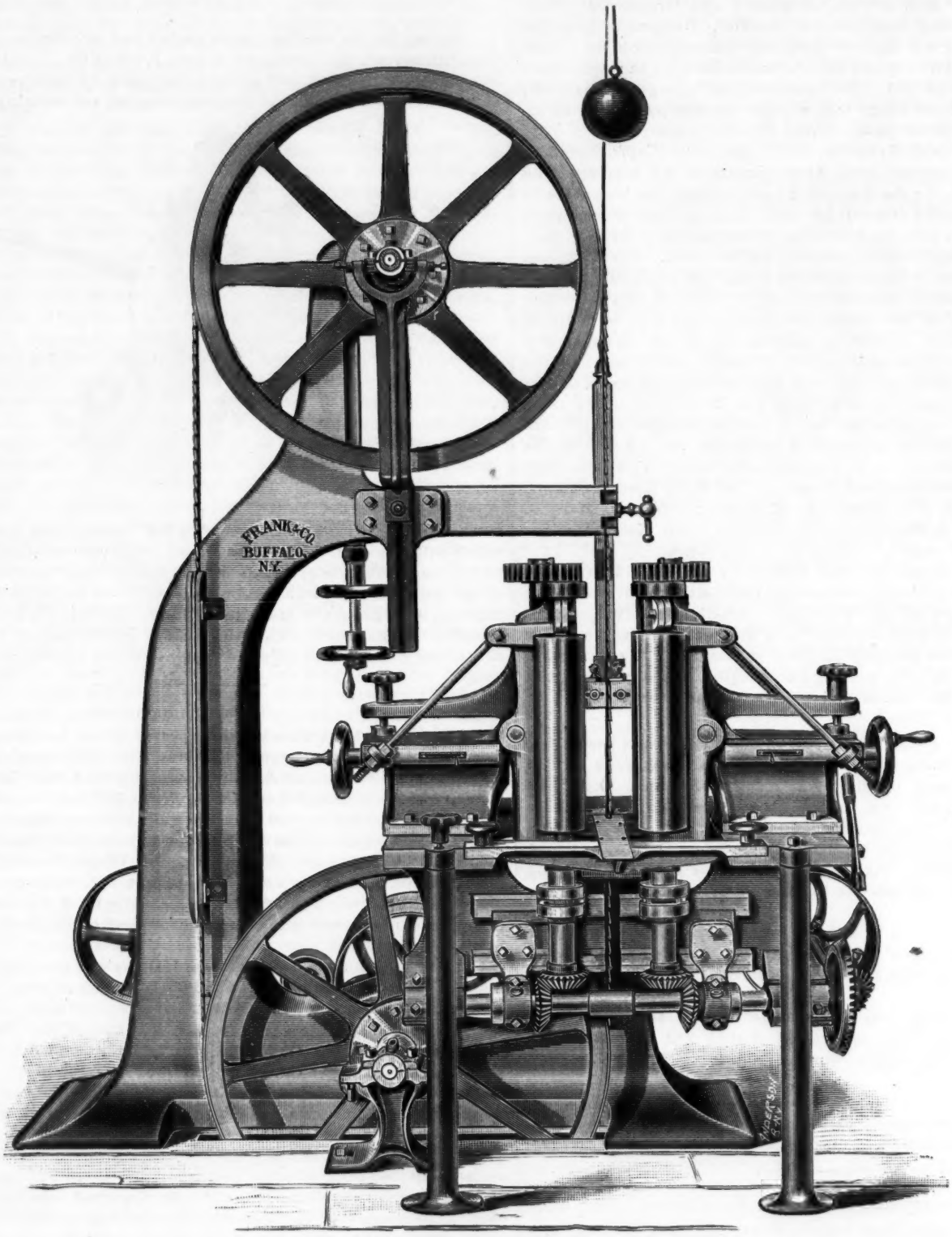
An Iron Company Asks Time.

The Moorhead-McCleane Co., Pittsburgh, Pa., has asked its creditors for an extension. The assets are said to be fully twice the liabilities, which are estimated at over $800,000. Of this amount $350,000 is accomodation paper, and $400,000 in the shape of mortgages. The leading creditors are the Bank of Pittsburgh, the Tradesmen's, Fort Pitt and Exchange National Banks of that city. It is understood they will all agree to the proposed extension.

The Company lost nearly $80,000 within a year past through the embarrassment of two heavy customers, $56,000 of this amount being on the Columbia Iron & Steel Co., of Uniontown, which went into the hands of a receiver several months ago. It is stated that the illness of President Moorhead and Vice-president McCleane for some time past has had much to do with the company's troubles. The works, at which the pay-roll is about $50,000 a month, will continue in operation as usual. The banks will not be affected.

A NEW BAND RE-SAW.

The above machine herewith illustrated, was built to meet the demand of persons wanting a re-saw that would not waste so much of their lumber. After experimenting for over a year the manufacturers have perfected a tool that they warrant to give perfect satisfaction. The machine is built by the most skilled workmen and of the best material they can buy. The wheels are made from wood glued up in their sections, and are 42 inches diameter, 3¼ inches face. The upper wheel is adjusted by a very simple and handy device. The journals for upper and lower wheel shafts are 12 inches long, and both have an outside bearing. The rollers are 4½ inches diameter, and are geared in same manner as circular re saws, giving a very strong and positive feed. The feed is instantly started and stopped by a clutch-pulley. The rollers can be tipped for sawing bevel weather boarding, etc. The machine is furnished with brass guages to show exactly at what angle your machine is cutting.



A NEW BAND RE-SAW.

The capacity of machine is 6 inches thick and 26 inches wide, and will feed with two feeds sent with machine, 27 and 54 feet per minute. The machine weighs 4,500 pounds. The entire heighth of machine is 9½ feet. The saws sent with machine are two 2½-inch saws, 25 feet long, one for hard and one for soft wood. The floor space required is 8x8 feet. The tight and loose pulleys are 20 inches diameter, 6½ inches face, and should run 450 per minute. Address Frank & Co., Buffalo, N. Y.

Are Steel Castings of Steel?

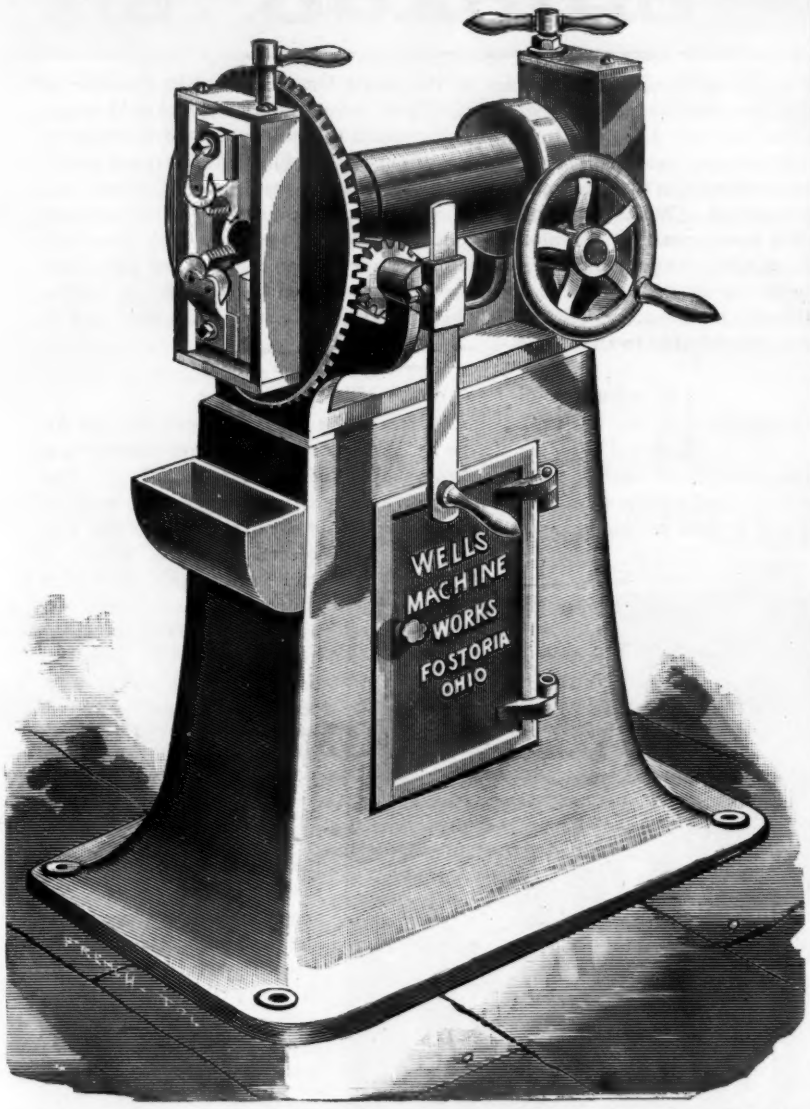
Steel castings are no doubt far superior to iron in many respects, and when first introduced were of a good quality, but like all other good things for which there is a demand, the quality has deteriorated as the demand increased, or rather, advantage has been taken of the demand to foist upon the users an inferior article. There are probably but few of the so-called steel-casting concerns that actually make steel castings. Steel and iron scraps of a miscellaneous character are melted in an open-hearth furnace, and the product is put on the market as pure steel castings. Steel scraps melted in a crucible is designated as crucible steel, but its actual composition would not bear analysis. It is impositions and trickery of this kind that injures any legitimate business, and brings the genuine article into disrepute, and is a practice unworthy of American industry and enterprise.—[Manufacturers' Gazette.

Electric Lighting in London.

The progress of electric lighting in London is very rapid. From the tentative experiments made some years ago, the electric light has now reached a stage when it may be said to have obtained a firm footing. In some districts, notably in the city, gas has been entirely disregarded, and in this respect the corporation, which has hitherto been looked upon as highly conservative body, has set a good example. In the whole metropolis there are now eleven companies possessing provisional orders under the Board of Trade, and having an aggregate capital of £3,000,000. These companies have 16 stations, supplying 240,000 lamps of 8 candle-power. These stations are equipped with engines of an aggregate of 20,000 indicated horse-power, and effect their distribution by means of 240 miles of copper conductors laid under the roads and pavements. The area served is chiefly embraced by the Strand and Oxford street districts, Mayfair, St. James's, Westminster, Kensington, and Belgravia. The lighting of the city has commenced, and will be rapidly proceeded with. There, as already observed, the street lighting will be effected by electricity, and not a single gas-lamp will remain in the streets. Taking the revenue per lamp at 10s, the gross receipts on £2,000,000 of paid-up capital are now £120,000 a year. To the above figures we must add Mr. Frank Bailey's estimate of the equivalent of 85,000 lamps, worked from private installations, and also about 1,000 arc lamps.

A HANDY PIPE-CUTTINC MACHINE.

The Wells Machine Works, of Fostoria, O., represent by the accompanying engraving one of their new line of pipe-cutting and threading machines, ranging from ⅛ inch up. This engraving illustrates a hand machine which can be taken from its base, is easily transported and can be readily fastened to a bench. The dies are in sections and adjustable, are easily removed and replaced, are gauged to standard fittings. They open to remove the threaded pipe without reversing. The cutting-off mechanism shown is three wheel cutters, actuated by the same screw that actuates the dies. Thus the pipe is cut and threaded with one closing of the vise and without removal or change of dies or cutters. For larger pipe a square cutting-off knife with positive screw



feed is used, which is illustrated with this combined hand and power machine. The vise has powerful steel jaws, has longitudinal motion by means of cylindrical arbor and steel rod guides, is actuated as shown by rack and pinion. Larger machines have universal lead screw instantly connected or disconnected at will, which can be used independent of the rack and pinion, and vice versa. Persons interested will do well to write to the Wells Machine Works for full descriptive matter of their machines and tools.

IRON AND GRAIN SELLING COMPARED.

The difference between strictly legitimate trade and speculation pure and simple is well illustrated by comparing the fluctations in prices from time to time between iron in its unmanufactured form and wheat as it comes to market. Both are staples in the fullest sense of the trade term; but the iron market has been mercifully preserved from being tossed hither and thither, or forced up and down by the speculative bulls and bears who make of wheat a sort of a foot ball to sportively kick over the floors of the exchanges of the country.

A change of price in iron, or rather an advance, is at the rate of about 25 cents a ton, and having been accomplished it takes months to effect a return to former values. Not so with wheat. Among the speculators price and value have no relation to each other or only so much as they choose to recognize or allow. Moreover, the vagaries of speculators often produce such startling results with respect to wheat prices, that the real value of the cereal for legiti mate purposes is entirely lost sight of. But a few days ago, for instance, the speculators on the Chicago and St. Louis Boards ran up the price of wheat so high and then suffered it to sustain so serious a fall that the difference, nominal in money value represented between the highest and lowest price attained, aggregated millions upon millions of dollars, or would have done so had the transaction been real instead of bogus, and actual wheat exchanged instead of merely bets upon paper. The indifference of the speculators to the price of wheat is shown in the fact that during the excitement they boomed the cereal far above its export value, and then broke the market by betting the grain down below its selling value for cash.

Such sort of trading as this would not be considered legitimate in the iron market or indeed in any other market for staples, except on the exchanges where gambling in grain is tolerated under the euphemism of dealing in futures, which it is not, for dealing in futures may be perfectly legitimate and subserve the best interests of both buyer and seller, as when, in ordinary trade, goods are ordered months ahead for future delivery.

If the speculative deals in grain were confined only to the margin operators who directly make the deals, the harm to the public would be limited. But they are able to inflict much commercial injury on trade at large by unsettling prices and otherwise, and thus are in every sense detrimental to the best interests to the trade and commerce of the country.—[Stoves and Hardware Reporter.

CLEANING SURFACES BY THE SAND BLAST

For the past two weeks a new application of the sand blast to the cleaning of stone structures has been attracting attention where it is being tried in renovating the rather grimy exterior of the old marble building of the United States Assay Office on Wall street, in New York. The process is an outcome of experiments by those able investigators, Messrs. B. C. and R. A. Tilghman, of Philadelphia, the original inventors of the sand blast, which has within the past 20 years developed so wide a field of usefulness in the industrial arts.

In the earlier days of the sand blast the abrasive material was made to circulate through the fans and the whole length of the delivery pipe, to the manifest injury of the apparatus. Successive improvements have led to the design of a so-called "gun," four of which have been in operation at the Assay Office. This "gun" is an instrument about 3 feet long, consisting of a tube of sheet tin 2½ inches in diameter, bent at the forward end into a "goose-neck" form, and terminating in a 2-inch nozzle. A second tube, 1 inch in diameter is fixed above and parallel to the larger tube, and enters it at the upper bend of the "goose-neck" and terminates about 3 inches within, being accurately centered in that part of the tube which carries the nozzle. The sand is fed into the 1-inch tube from a hopper, and a flexible connection between the hopper and the tube leaves the "gun" free to be moved by the operator as desired in directing the blast against different parts of a wall. The air blast passing through the large tube draws the sand forward out of the smaller one. There is also a flexible rubber tube connection between the "gun" and the main air delivery pipe.

By the introduction of a small jet of steam into the air blast enough moisture may be provided to dampen the dust of abrasion, which would otherwise be something of a nuisance.

With an air pressure at the nozzle of about two pounds, one square foot of marble will be abraded to a depth of from 1-64 to 1-32 of an inch in one minute, leaving a fresh, clean surface. One can easily calculate the time required to renovate the exterior of a building at that rate, making allowance for erecting and removing the necessary scaffolding.

The work on Wall street has proceeded slowly for the reason that only one No. 2 Root blower has been employed, and this has been operated under only about 60 pounds steam pressure, in addition to which the blower was placed so far from the "guns" that much power was lost from friction and leakage. The company having the work in charge is now arranging to procure sufficient steam, and at a more desirable point, so as to reach a normal rapidity of execution. During the past week the air pressure at the nozzle has been only one fourth pound.

Recently the "chilled iron shot," one of the triumphs of the Messrs. Tilghman, which practically revolutionized the art of stone sawing, especially in the case of granite, has been used in place of sand in the blast for cleaning iron work, such as armor plates and ships' bottoms. A number of bottoms were thus cleaned a short time ago for the British navy at the Portsmouth Dock Yard, and it is expected that the new method, which possesses the advantages of quickness, thoroughness and entire freedom from danger to to the plates treated, will soon be tried in this country.—[Railroad Gazette.

On De-sulphurizing Molten Cast Iron.

When commercial ferrous sulphide (FeS), containing about 35 per cent. of sulphur, is melted together with ferro-manganese, the sulphur separates as a slag in the form of manganous sulphide, leaving the iron free. This reaction is utilized in a process introduced by the Hoerde Steelworks Co., in Westphalia, Germany, for obtaining pig iron, for the basic Bessemer process free from sulphur; experiments having shown that fluid sulphurous metal from the blast furnace might, by the addition of highly heated melted ferro-manganese, be purified to as low as 0.01 per cent. of sulphur. The resulting manganese sulphide slag contains 20 per cent. and above of sulphur, and about 50 per cent. of manganese, and when subjected to a reducing fusion, with lime as a flux, ferro-manganese is recovered, and can be applied for desulphurizing further quantities of metal. In order to carry out the operation successfully, it is necessary to keep the bath liquid for a sufficient time, either by its own or externally applied heat, so that the slag may separate completely. The most convenient apparatus for the purpose is a Bessemer converter, made up without tuyers in the bottom, and the operation should be repeated several times before pouring, in order to obtain a large volume of slag which can be then easily removed, and to promote its separation by the stirring action caused by each new addition of metal. From the results obtained at Hoerde in 15 trials made in August and September, 1890, it appears that the sulphur in metal from the blast furnace, ranging between 0.27 and 1.20 per cent, was reduced to between 0 34 and 0 56 per cent. in the purified metal for the converter, the charges being from 10 to 11 tons each. The sulphur in the finished steel was 0.018 per cent.. from a metal originally containing 0.352 per cent., and 0.025 per cent. from that with 1.20 per cent. The effect of spiegeleisen and ferro-manganese as ordinarily used for recarburizing blown metal is somewhat similar, but is less advantageous, as being likely to unduly increase the carbon or manganese on the finished steel.—[Colliery Guardian.

STEAM USERS Should Read this.
Increase the Capacity of your Boilers.
Scale is a Non-conductor of Heat.

SAVE YOUR FUEL AND PROTECT YOUR BOILERS FROM SCALE AND GALVANIC ACTION OF WATERS. WATERS ANALYZED **FREE** AND THE COMPOUNDS MADE TO SUIT EACH WATER.

INTERNATIONAL BOILER SOLVENT.
(PURELY VEGETABLE.)

Dearborn Drug & Chemical Com'y,

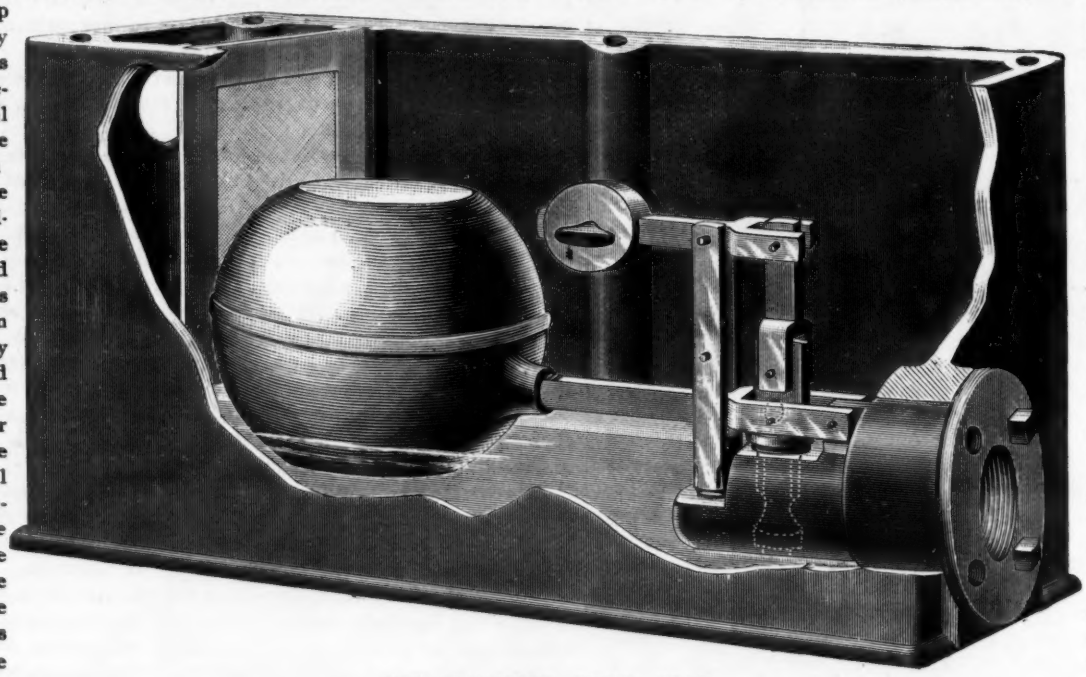
Manufacturing and Analytical Chemists, W. H. EDGAR, Manager. Office, Room 29, Rialto Building; Works, 4246 Champlain Avenue;
Ohio Office, Canton, O. ROBERT H. CREVOISE, Agent.
WRITE FOR INFORMATION AND PRICES. BEWARE OF INFRINGEMENTS.
CHICAGO, ILL.

THE PROCUNIER STEAM TRAP.

Among the numerous styles of steam traps on the market there are few, if any, that have reached that state of perfection that makes them fully as desirable as they might be, or that are altogether realiable. Special steam traps there are for special purposes, whose action is fairly reliable, but their scope is so limited as to necessitate the use of auxiliary apparatus, and need more attention than the modern requirements of machinery will permit.

The Procunier steam trap shown in the accompanying cut possesses some new features which constitute considerable of an improvement over any now on the market, and fit it for a field of usefulness not heretofore filled. The design of the trap is such as permits it being made in sizes so small as to be readily attached direct to steam radiators or coils where it will serve a purpose not covered by any other simple device. The larger sizes of traps are capable of removing the condensation from 10,000 feet of inch pipe.

This trap not only operates to remove the water of condensation as it accumulates, but also removes all air that may gather in the chamber, and which usually interferes with the continual working of the apparatus. Another desirable feature of the trap is that it is automatically drained when the steam is shut off the radiators. Referring to the cut, it will be seen that the principle features of this trap consist of a float and a double ported valve which is delicately balanced by the counter-balancing lever and weight. When the trap is in action, the float rests on top of the water that may have accumulated, and when this has become sufficient, the float lever raises the valve and the water escapes until its level has fallen considerably below that at which the valve was caused to open, the valve being closed by the pressure of steam on the top. The double valve has a much larger disc at the top than at the bottom, so that it is held closed by the pressure on top disc while there is a pressure in the trap, but when steam is shut off, this pressure is relieved and the weight of the counterbalauce opens the valve and the trap is completely drained. Acting as an air valve, its operation is perfect, for when the steam is turned on the valve remains open, and all the air is expelled before the pressure becomes great enough to close it. The smaller sizes of these traps may be connected in place of the return valve on radiators, etc., without altering the system, and will thereby prevent live steam from entering the return pipes, thus making a large saving in the amount of steam used. The apparatus may also be of advantage when applied to engine cylinders and acting as cylinder cocks trapping the water of condensation. The floats are made of brazed copper, and can be relied on, as they will never collapse. All parts of the apparatus are built of material best suited to the purpose. Manufactured by Spaulding & Metcalf, Chicago.



THE PROCUNIER STEAM TRAP.

The Determination of Silica in Presence of Iron.

The presence of a large quantity of iron is generally considered capable of interfering with the determination of silica by evaporation to dryness, says M. Leclerc, in the *Chemical News*. The decomposition of ferric chloride may be avoided by uniting it with potassium chloride so as to form a double salt, a well-known device which has been long ago utilized by M. Schloesing. For instance, in the determination of silicon in cast iron 1 grm. of the metal is treated with 20 c. c. of nitric acid and 10 c. c. of hydrochloric acid. After the reaction is over, the chief part of the nitric acid is expelled by ebullition with successive additions of hydrochloric acid—30 c. c. each; 3 grms. of ammonium chloride are added, and the liquid is concentrated to the state of a syrup. The evaporation is completed in the stove, so as to expel the last traces of the nitro compounds in the state of gas. The residue is taken up in hydrochloric acid; there are added 3 grms. pure potassium chloride and water enough to dissolve it, and the evaporation is then continued to dryness. The double iron and potassium salt crystalizes at the same time as a certain quantity of double iron and ammonium chloride. These salts are soluble in cold water, but they are first dissolved in hydrochloric acid to remove assessory elements. The silica coagulates upon the residue of carbon; it filters and washes easily. After ignition at a high temperature it remains pulverulent, but dense and easy to weigh. Without the presence of ammonium chloride this silica would contain manganese; it will also be contaminated with potassa if all the nitric acid has not been previously expelled. Chrome is also re-dissolved completely by taking up the residue at first in concentrated acid. It is well to reduce a little of the chrome to chromous chloride by dissolving a little pure zinc or aluminum chloride in the liquid.

The Influence of Heat on the Strength of Iron.

Professor Martins, Berlin, has published in the *Mittheilungen aus den koniglichen technischen Versuchanstalten zu Berlin* a report of some experiments on the strength of steel at various temperatures between 20° and 600° C. The materialy used consisted of mild steel, having a tensile strength of 23 tons, 27 tons and 30 tons per square inch, respectively The bars from which the test pieces were cut were 1½ inch in diameter and were thoroughly annealed. A number of bars of the same quality of metal were all tested in the usual way, both after annealing and as received from the makers, so as to form a standard of comparison for the other bars. The temperature of the bars was obtained by placing them in a bath and testing them there. For the low temperature tests the bath was filled with a freezing mixture, and for the high temperature tests, with paraffin, up to 200° C. beyond which alloys of leads and tin were used. The contents of the bath were warmed by gas jets, and stirred during the course of the experiments. The elongations of the bar up to the yielding point were taken on the length of 8.1 inches, by means of a mirror apparatus, the diameter of the tested portion being 0.79 inch, and autographic diagrams were also taken of each specimen. The results of the experiments showed that the elastic limit of the material became lower as the temperature rose, though the falling off was not very serious up to 200° C., but beyond that point it lowers somewhat rapidly, and finally seems to disappear. The maximum stress decreases from 20° C. up to 50° C., but afterwards rapidly rises to a maximum somewhere between 200° C and 250° C. Taking the strength of the specimen at 20° C., the maximum stress for the 23-ton steel is 1.34 greater, and the maximum breaking stress is 1.62.

Cost of Motive Power.

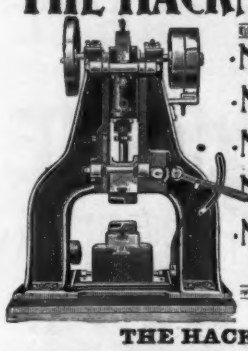
In Birmingham, England, there are horse cars, omnibuses, electric cars steam cars and cable cars, all operated under the direction of the Birmingham Central Tramway Co., limited, and the reports of this company, as commented upon by *Engineering*, afford a basis for interesting comparisons of the efficiency and economy of the different systems. The bulk of the traffic is handled by the steam lines, the cable roads coming next and the electric roads third.

The expenses, earnings and profits per mile run on the different systems are given as follows:

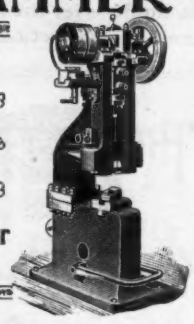
	Expenses. Cents.	Earnings. Cents.	Profits. Cents.
Steam	21.98	31.34	9.36
Horse	19.58	22.04	2.46
Cable	12 66	24.06	11.40
Electric	19.80	30.30	10.50

Along with these figures should be considered the fact that the horse cars constitute the original system, the steam lines have been in operation several years, the cable has been running only two or three years, while the electric lines were started only in July of this year.

·THE HACKNEY POWER HAMMER·



·No Rubber Cushions to wear out.
·No Straps to Break.
·No Springs to crystallize.
·No adjustments to be made.
·No alteration in speed for light or heavy blow.



THE HACKNEY HAMMER CO., CLEVELAND, O.

OUR GREAT IRON PRODUCING STATES.

The obviously absurd assertion by numerous Southern papers, that Alabama last year surpassed Pennsylvania as a pig iron producer, has called out a vigorous article by our old-time associate, Mr. Edmund C. Pechin (in the *Iron Belt*), in the course of which he says:

Instead of Alabama having exceeded Pennsylvania in the production of pig iron, she is so far in the rear as to make comparison almost ridiculous. The Roanoke *Times*, in its issue of July 21st, gave figures of production which I have verified. They are correct and the following is the pig iron output of the three leading States for the last three years:

	1888.	1889.	1890.
Pennsylvania	3,589,186	4,181,242	4,712,511
Ohio	1,104,818	1,215,572	1,302,299
Alabama	449,492	791,425	890,432

It will be seen that Alabama did not make *one-fifth* of Pennsylvania's output.

What you subsequently stated, viz., that Alabama's ore output exceeded that of Pennsylvania, is right, according to the Census Bulletin. Alabama has nothing to depend upon except her own local ores, and necessarily when a new furnace is built, new mines must be opened.

Pennsylvania, on the contrary, year by year has been lessening the mining of her own lean ores, and depending more and more upon the rich, high-grade ores of Lake Superior, and from this source alone she can indefinitely draw her supplies. The shipments of lake ores, averaging 60 per cent. of metallic iron, were last year nine millions of tons, and there is to-day more ore in sight than ever before, and new districts constantly opening up.

The South has nowheres within her borders, as far *as known and proved*, a deposit of ore like the Cornwall magnetic ore mine, in the Lebanon Valley, in the very heart of Pennsylvania. The property of practically a single family, it has never been worked for the general market, but as a rule for the furnaces in which the owners were interested, but a change in this policy could at any time put a large quantity of ore on the market. I very much doubt whether there is anywhere in the United States, a deposit of ore that can be mined as cheaply as this.

"Comparisons are odious," but sometimes useful. A recognized authority, the Directory of the Iron and Steel Association for 1890, gives Alabama 38 coke furnaces, Pennsylvania 218, made up as follows: anthracite or anthracite and coke mixed, 156; coke, 62. For safety's sake we will knock off one-third of the mixed anthracite and coke furnaces, reducing the total number of available furnaces in Pennsylvania to 166. Deducting the 38 Alabama furnaces, this leaves Pennsylvania 128 furnaces in the lead.

Two hundred thousand dollars is a moderate estimate of the cost of a furnace, and therefore, to put Alabama abreast of Pennsylvania in furnace capacity, she must invest in cash for construction alone at least $25,000,000.

To open mines to supply these new furnaces, and to provide a very moderate working capital, will require, say $25,000,000 or more, so Alabama must look squarely in the face the providing of $50,000,000 hard cash to equal Pennsylvania as an iron producer, provided Pennsylvania stands still.

Any talk about Alabama equaling or leading Pennsylvania as a pig iron producer is senseless bosh. Neither Alabama, nor Virginia, nor any other Southern State wants to lead Pennsylvania or Ohio in this particular.

The true index of a community's progress and prosperity is not the raw pig iron it is making or can make, but what amount of iron and steel it produces in finished forms. The making of pig iron to be shipped away on a slender margin of profit, so far from being an advantage, is a positive loss. The coal and ore are being exhausted and the machinery worn out, without any adequate return.

At the present time neither Alabama or Virginia need any more furnaces. What they want and must have to be prosperous, are the mills and foundries and shops right at home to work up all the pig iron that they are now making or can make. This is true development and true progress. First supply the home market with manufactured goods, then seek neutral markets, and then competitive ones.

Alabama's 900,000 tons of iron, if sold at $12 a ton, means $11,000,000 distributed. If put into even cheap castings, it means $25,000,000. If worked into higher forms of iron and steel it means from $30,000,000 to $50,000,000.

When the next census comes what the South wants to show, is not how much pig iron it makes, but that all that it is making is being consumed at home. On such an outcome she can justly brag.

Last of the Season.

Sept. 19th, the last Niagara Falls excursion of the season will be run over the Nickel Plate, Saturday night trip going; arriving at the Falls early the next morning. Same low excursion rate and ample accomodation in our Pullman palace day coaches and sleeping-cars. Ask nearest Nickel Plate Agts.

CENTRAL THOMSON-HOUSTON COMPANY,

48 ARCADE, CLEVELAND, O.

S. D. NESMITH, - - - - - - Manager.

Motors from 1-12 h. p. to 100 h. p.

ELECTRIC LIGHT PLANTS INSTALLED,

Arc and Incandescent, Direct and Alternating,

ELECTRIC FANS!
FANS FOR VENTILATING!
ELECTRIC SUPPLIES.

INDUSTRIAL SUMMARY.

New Enterprises:—

Louis Schultz, of New Orleans, has secured permission to erect and operate an iron forge at that place.

S. T. Williams, of Baltimore, Md., is endeavoring to organize a stock company for the purpose of manufacturing his steam engine.

The American Car Co., of St. Paul, Minn., has been incorporated by W. Ruttom, Emil Alexander, T. Papin, Jr., with capital stock of $100,000.

The Wormer Machine Co., St. Louis, has been incorporated; capital, $3,000. The stockholders are Theo. K. Wormer, Alfred M. Shepard and Frank Hargensieker.

International Electric Manufacturing Co., of Chicago, has been incorporated; capital, $100,000; incorporators, J. S. Fifield, E. T. Brainard and T. E. Rushbrook.

The Mills Improved Pneumatic Brake Co., of Chicago, has been incorporated at Illinois, with a capital stock of $600,000, by W. Mills, W. B. Mills and O. A. Bogue.

Articles of incorporation of the Minneapolis Malleable Iron Co. have been filed in Minnesota; capital stock, $50,000. The works will be located at St. Louis Park, Hennepin County.

G. J. Bucker, of Frederick, W. J. Baker, E. L. Keller and others have, it is stated, organized a $25,000 stock company for the purpose of establishing a plow factory in Buckeyetown, Md.

The Rockingham Combination Slat & Wire Fence Machine Co. has been incorporated at Harrisonburg, Va., to manufacture and deal in slat and wire fence machines; capital stock, $50,000.

The Peoria Fence Co., Peoria, Ill., was organized on the 19th inst., for the purpose of manufacturing and selling a combination wire and iron fence. Frank Garthuvit and Martin V. B. Cumetford are the incorporators.

The Buffalo Drop Forge Co. have applied for a certificate of incorporation to manufacture and sell drop forgings, tools and machinery; capital, $40,000; directors, Samuel C. Rogers, Geo. D. Barr, Rob't T. Walker and others.

Mr Josiah Holmes, of Cumberland, Md., will start at once the erection of a machine shop, which will be the nucleus of a rolling mill he intends to erect. The rolls have already been ordered and also a large amount of machinery.

A new company, to be known as the Clark Cutaway Harrow Co., has been formed at Higganum, Conn., to succeed the defunct Higganum Manufacturing Co. The capital stock is to be $50,000, divided into 2,000 shares of $25 each.

A company, of Providence, R. I., has had representatives in Anderson, Ind., looking for a suitable site for the erection of its steel works. The product of the factory will be steel goods of various kinds, and will give employment to about 500 men.

M. N. Coe, Edward de Never, T. H Roberts and others have incorporated, at New Orleans, La., the Coe Manufacturing Co., Limited, for the manufacture of the Coe automatic rain-water cut-offs, gutter piping, cisterns, etc. The capital stock is $100,000.

The D & D. Electric Manufacturing Co, of Minneapolis, Minn., has been organized, with a capital of $50,000. It will manufacture and sell electric motors, dynomos and other electric appliances. Gilbert Donaldson and Thos. Davis, of St. Paul, and Frederick G. James, of Minneapolis, are the promoters.

The Curran Oil-saving Bearing Co., of Chicago, has been incorporated, with capital stock of $100 000. The company will manufacture an oil-saving bearing for car journals and other machinery. Wm. Curran, R. T. Bertelsen, Herman Lorenz, August C Glover and Friedrich Roehl are the stockholders of the company.

Additions, Enlargements, Removals, etc.:—

The Upson Nut Co., of Unionville, Conn., is to build a new boiler house.

Leonard & Cornell, boiler makers, of Jackson, Mich., contemplate removing their works to Elkhart, Ind.

The West End Rolling Mill Co., of Lebanon, Pa. have increased their capital stock from $80,000 to $100,000.

The Grand Haven Electric Light & Power Co., Grand Haven, Mich., has been incorporated; capital, $10.000.

Work on a hammer shop, a producer house and a boiler house to be added to the Boles Steel Car Wheel Co.'s works, at Scranton, has been begun.

Youngstown, O.

It is thought that arrangements will be made whereby the Muncaster McKaig Iron & Steel Shafting Works will be removed from Cumberland, Md., to

The Courtwright Manufacturing Co., of Detroit, manufacturer of railroad hand cars and other supplies, will soon remove its works to Benton Harbor, Mich., where land has been purchased for new works.

The Duquesne Tube Works Co., which recently erected large additions to

THE STIRLING COMPANY

MANUFACTURE

The Safest, Most Economical, Compact and Durable High Pressure

WATER TUBE BOILERS.

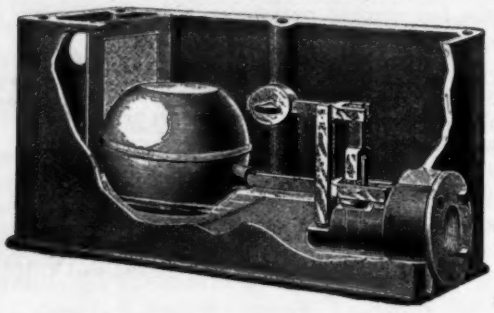
All Wrought Steel. Large Mud Drum. Perfect Circulation.

By removing four manhole covers access is gained to every part of the boiler. Dry steam and great economy of fuel guaranteed.

GENERAL OFFICE: Pullman Bldg., Chicago. PITTSBURGH OFFICE: Lewis Block. NEW YORK OFFICE: 74 Cortlandt St.

Works: BARBERTON, SUMMIT COUNTY, OHIO.

THE PROCUNIER STEAM TRAP ON TOP.



The only STEAM TRAP made that opens mechanically and drains itself when steam is shut off.

Sent on Thirty Days Trial.

SPAULDING & METCALF,

63 S. Canal St., Chicago, Ill.

51 N. Seventh St., Philadelphia, Pa.

its plant at Duquesne, Pa., has decided to increase the capital stock from $100,000 to $150,000, and will shortly add a rolling mill to its capacity.

John Adt & Son have just completed a new foundry at New Haven, Conn.

Fires and Accidents:—

The entire plant of the Youngstown Bridge Co., at Youngstown, O., was destroyed by fire on Thursday, September 3rd. The loss is estimated at $75,000, with an insurance of $60,000. Immediately after the fire a meeting of the board of directors was held, and it was decided to rebuild the plant at once.

The large plant of the Delaware Iron Works, at New Castle, Del., belonging to Morris, Tasker & Co., was destroyed by fire, September 12 The fire started in the flue mill, and was undoubtedly caused by sparks flying from the hot iron pipe as it passes through the rolls and lodging in a wooden ventilator. The entire plant is valued is $1,000,000, and the departments destroyed are the blacksmith shop, flue mill, bending mill, socket shop and ball shop. It will be some time before the works can again be started in full. The loss is placed at $300,000.

General Industrial Notes:—

Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C.; until two o'clock, P. M, on the 9th day of October, 1891, for all the labor and materials required for putting in place complete the low-pressure, return-circulation, steam heating and ventilating apparatus, for the United States Post Office building, at Kalamazoo, Mich.

The partnership heretofore existing under the firm name of Uihlein, Applegate & Co., has been dissolved, and the business in the future will be continued under the firm name of Julius Uihlein & Co., at 146 West Second street, Cincinnati, O., who will continue in the same line of business, consisting of shafting, pulleys, hangers, couplings, machinery, tool and spring steel, wire rope, etc.

The Totten & Hogg Iron & Steel Foundry Co., of Pittsburgh, Pa, have just received an order from the Pacific Iron & Nail Co., of San Francisco, for a car load of rolls. This is the second order of this kind received from this company within a month, which speaks well for the rolls. They are also in receipt of an order from the Canonsburg Iron & Steel Co., of Canonsburg, Pa., for two large gear wheels weighing about 25 tons.

A new and novel radial drill is being brought out by Messrs. Dietz, Gang & Co., of 58 and 60 Plum street, Cincinnati, O. There are a number of new and valuable features being introduced into the machine which will be duly appreciated by the practical mechanic. An illustration and full description will soon appear in these columns. Mr. Dietz has been for twelve years actively identified with the machine tool business of Cincinnati, and Mr. Gang, a very finished mechanic, severed his connection some time ago with the Lodge-Davis Co. in order to develop and introduce his new improvements.

SEPTEMBER 19th the Nickel Plate runs their last Saturday night excursion to Niagara Falls. Toronto, $1 extra. Chautauqua free.

A New Welding Powder.

An excellent powder for welding wrought iron is described by a German contemporary. It consists of borax, 50 per cent.; sal ammoniac, 25 per cent, and water, 25 per cent. This mixture is boiled, being at the same time continuously stirred until it is reduced to a stiff mass, which is then held over a fire until it becomes hard. When cold, the mixture is well pulverized and assimilated with one-third part of rust-free wrought iron fillings. The pieces to be welded are first dovetailed, or otherwise connected; the welding parts are then heated to redness, when the powder is strewn over them and allowed to liquify over the fire. Only very slight blows are then required to consummate the perfect conjuntion of the pieces.

THE AETNA MEDIUM & HIGH SPEED ENGINE

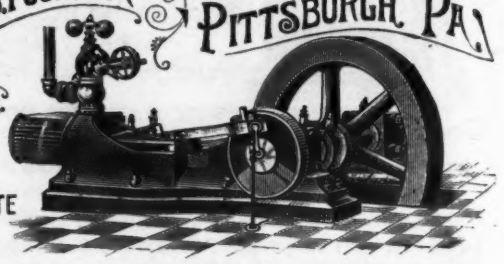
Manufactured by THE TOTTEN & HOGG I. & S. FOUNDRY Co. PITTSBURGH, PA.

150 to 2000 H.P. Latest Design.

FOR ROLLING MILLS AND ALL OTHER WORKS WHERE LARGE POWER AND CLOSE REGULATION IS REQUIRED

CONTRACTS MADE FOR COMPLETE STEAM PLANTS.

ENGINES ALWAYS IN STOCK.



WHY? ARE YOU USING THAT CLUMSY OLD FASHIONED HOT IRON ROD FOR YOUR FLUE CLEANER? "FIREMEN'S FRIEND". WHY?

DO YOU NOT USE THE "FIREMEN'S FRIEND" AND SECURE RELIEF.

MANUFACTURED BY BUTMAN FURNACE CO.

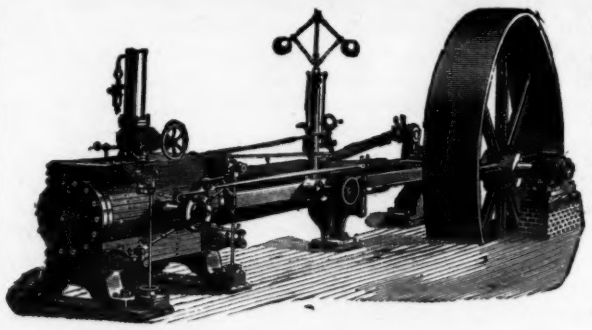
64 & 66 S. CLINTON ST CHICAGO ILLS.

ADDRESS,

THE W. BINGHAM COMPANY, CLEVELAND, O.

JOHN S. HALL, 40 CORTLANDT ST, NEW YORK, N. Y.
H. D. EDWARDS & CO., 16-24 WOODWARD AVE., DETROIT, MICH.

- MACHINERY. -



Iron and Wood Working Machinery of every description; Corliss Engines and Boilers; Shafting, Pulleys and Hangers.

Agent for Bement Miles & Co., Philadelphia, and Eastern Agent for J. A. Fay & Co.

GEO. PLACE,

ESTABLISHED 1855

120 BROADWAY, N. Y

Chicago, Milwaukee, & St. Paul Ry. Co.

GENERAL OFFICE;

160-172 Adams St., Chicago.

INDUSTRIAL DEPARTMENT.

The Chicago, Milwaukee & St. Paul Railway Co. invites manufacturers, wholesale houses and jobbers to settle on its lines.

Its Industrial Department is conversant with the resources, water powers, advantages and facilities of the territory through which the lines run, and disseminates information concerning same. It co-operates with organizations seeking the advancement of cities and individuals interested in the development of natural resources. Eastern manufacturers contemplating a removal to Western points nearer the actual field of consumption of their product; or companies desiring to embark capital in Western industry, will be cheerfully supplied with information relative to the adaptability of localities to their particular requirements. The information furnished is absolutely reliable and has a practical bearing on the nature of the particular industry.

Inducements such as free sites, bonuses or removal expenses offered by active Western points, with the view of industrializing factories to locate, are becoming more and more rare. In the course of a few years they will altogether cease, because of the absolute merits of the West.

The Chicago Milwaukee & St Paul Railway Co, one of the greatest railway systems in the world (operating over 6 000 miles of road), runs through a vast territory rich in all the resources and advantages that insure industrial success.

The iron interests on the line will bear immense development. Large tracts of Hemlock bark will supply all the tanneries in the United States. Parties owning forests of Hardwood offer concessions to furniture factories that would locate; the lumber interests are great.

For further particulars relative to industrial advantages on the line, address,

LUIS JACKSON,

Industrial Commissioner,

C. M. & St. P. R'y, 160 Adams St., Chicago, Ill.

Advertising.

IF you wish to advertise anything anywhere at any time write to GEO. P. ROWELL & CO, No. 10 Spruce St., New York.

EVERY one in need of information on the subject of advertising will do well to obtain a copy of "Book for Advertisers," 368 pages, price one dollar. Mailed, postage paid, on receipt of price. Contains a careful compilation from the American Newspaper Directory of all the best papers and class journals; gives the circulation rating of every one, and a good deal of information about rates and other matters pertaining to the business of advertising. Address ROWELL'S ADVERTISING BUREAU, 10 Spruce St., N. Y.

Plate Iron Washers

A SPECIALTY!

Even in Gauge, smooth and well finished.

Cut from new plate, rolled expressly for the purpose. Write for prices, Address,

MILTON MFG CO., Milton, Pa.

SPICER MANUFACTURING CO.,

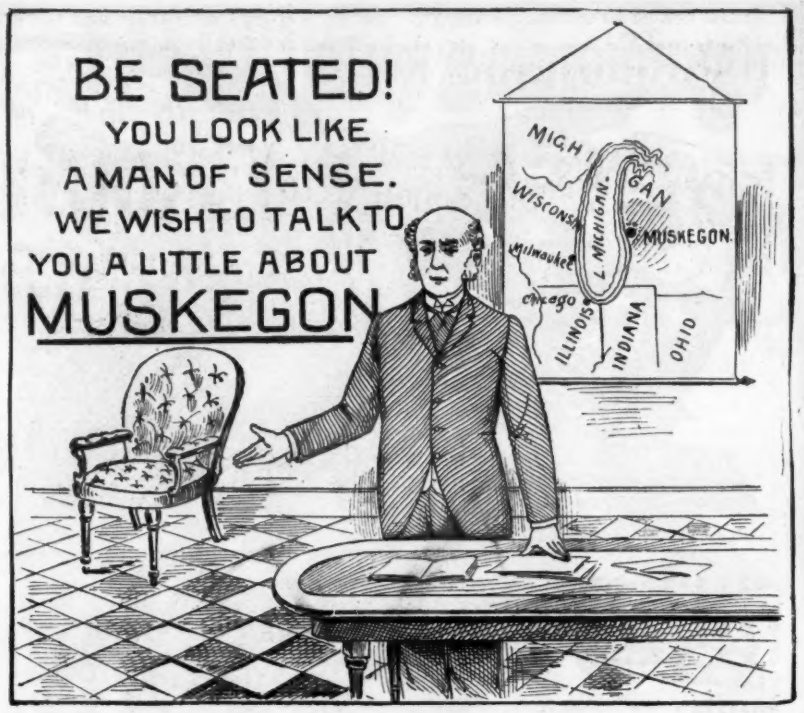
New Philadelphia, O.

General Foundry and Machine Work, Heavy and Light Castings.

Privilege to make estimates solicited.

PATENTS

For INVENTORS. 40-page BOOK FREE. Address W. T. Fitzgerald, Att'y at Law, Washington, D.C.



I wish to say to you that for the Manufacturer or Investor

THE CITY OF MUSKEGON, MICH.,

offers greater opportunities, has more real merit than ANY young City of the United States.

I AM aware that this is a BOLD STATEMENT, but I am prepared to give **Facts and Figures that will astonish you.** Notice this map on the wall, the Lake Michigan District, four States, having a common center (Lake Michigan). These four States, bordering on the **only** great body of water lying **wholly** within the United States, have an average age as States—61 years—and no district of the world ever made such a **record.** These four States: Illinois, Indiana, Michigan and Wisconsin, had, by the census of 1890, 9,781,255 population, or nearly **one-sixth** of the entire population of the Union; they have over **one-fifth** of the railway mileage of the United States, and over **one-tenth** of the railway mileage of the **world**; and talk about rapid growth—**Look at this table:**

NAME OF STATE.	GAIN LAST 30 YEARS.	PRESENT POPULATION—1890.
ILLINOIS	2,106,585	3,818,536
INDIANA	1,514,117	2,189,030
MICHIGAN	1,340,679	2,089,792
WISCONSIN	907,016	1,683 897
TOTAL	5,868,397	9,781,255

This 30 years gain—5,868,397—is MORE than the present ENTIRE POPULATION of the following FIFTEEN STATES, viz:

NOTE:—

MICHIGAN, which is twenty years younger than Illinois or Indiana, made nearly

23 PER CENT.

of the entire gain of this four-state district for the last thirty years.

THE FOUR-STATE GAIN WAS 5,868,397.

The present population of this four-state district is 9,781,255 or **MORE** than the 22 opposite: ☞

See U. S. Census 1890.

1	California	1,204,002
2	Colorado	410,975
3	Connecticut	745,861
4	Maine	660,251
5	Vermont	332,205
6	New Hampshire	375,227
7	Rhode Island	345,343
8	Delaware	167,861
9	Montana	131,769
10	Nevada	44,327
11	Washington	349,516
12	Utah	206,498
13	Oregon	312,490
14	North Dakota	182,425
15	South Dakota	327,848
	Total	5,796,598
16	West Virginia	760,448
17	Maryland	1,040,431
18	Florida	390,435
19	Idaho	84,229
20	New Jersey	1,441,017
21	Wyoming	60,589
22	New Mexico	144,862
	Total	9,718,609

NOTE.—Michigan gained more population in the last **30** years—see table above—than the present entire population of Connecticut, Vermont and Delaware combined, or within 5,000 as much population as Oregon, Washington, Colorado, Montana and Nevada have combined.

NOTE.—Michigan gained more population in the last **10** years than **Virginia and Georgia** together gained, or than **Kentucky and Tennessee,** or **Alabama and Mississippi** combined gained.

YOU ARE SURPRISED AT THIS.

It was your impression that all the growth and wealth of this district was at the south end of Lake Michigan, but let me tell you right here that the great intrinsic wealth is farther north, in the Iron, Copper, Salt and Timber district. The hardwood forests have scarcely been touched. Michigan puts out yearly over half the Iron Ore mined in the United States; more than all the Southern States combined. Nearly every pound of Steel made in Pennsylvania and Ohio is made from Ore coming from this district, (96.3 per cent of the Steel output of the United States for 1890 is accredited to six States lying along the **Great Lakes**) and this output was 100,000 tons more than that of Great Britain for 1889—**MICHIGAN FURNISHED THE ORE.**

When You Have Absorbed

THE

FOREGOING FACTS AND FIGURES

You are beginning to reach a point where you will appreciate the location of the City of

MUSKEGON.

Notice on this Map on the wall, and in the Cut below,

MUSKEGON'S CENTRAL LOCATION

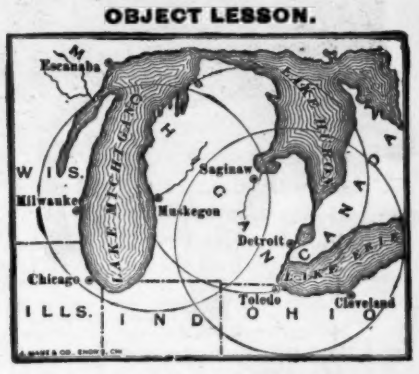
IN THIS GREAT

TEN MILLION POPULATION DISTRICT.

IT HAS THE BEST LOCATION IN MICHIGAN.

LOOK AT THIS!

OBJECT LESSON.



3 MICHIGAN CIRCLES.
NAVIGATION CITIES.

Radius of Each Circle, 125 Miles.

POPULATION:—Each Circle has in round numbers in United States population as follows:

SAGINAW CIRCLE,	- -	1,725,000
DETROIT CIRCLE,	- - -	2,600,000
MUSKEGON CIRCLE,	- -	2,725,000

NOTE.—See Cram's Atlas, Census 1890, by Counties.

The great business centers of this Lake Michigan District are the Coast Cities. Muskegon is third in size on this great body of water and has the finest natural inside Harbor on Lake Michigan, sixteen miles of water front, all available, deep water—114 miles from Chicago and 85 miles from Milwaukee, with which two cities **navigation is open the year round.** Only 175 miles by navigation from the greatest **Bessemer Ore** shipping docks in the **world.** Rare combination—**Raw Materials, Best Shipping Facilities and Best Markets** in the United States.

IT IS AN ACTUAL FACT that cargoes of heavy merchandise can be carried from **Muskegon** to the business center of **Chicago quicker** and for **less money** than the same quantity can be brought in **by rail** from points 10 to 15 miles outside the limits of Chicago. No experiment. Doing it now.

These great advantages are beginning to be appreciated. Twenty-one factories have been located in the last eighteen months. Among the factories secured are: **The Alaska Refrigerator Co., Large Rolling Mill, New Steel Works, Chase Bros. Piano Co., Sargeant's Invalid Chair Co., Nelson Piano Co., Mich. Washing Mach. Co., Malleable Iron Works, Machine and Foundry Co., Electric Alarm Co., Shaw Electric Crane Co., Houck Furniture Co., Electrical Power Co., Muskegon Cracker Co., Standard Oil Co. Barreling Works, Morton Key Seating Co., Kelly Bros. Mfg. Co., Heaps Earth Closet Co., Gray Bros. Mfg. Co., Hartshorn Shade Roller Co., New Flouring Mill**—All just completed or now building.

Why do you "CHASE RAINBOWS" on the outskirts of the Country, and invest at high prices, when you can get property near the great business center of the "Central West" for half the money, and having double the intrinsic worth?

A GOLDEN OPPORTUNITY IS BEFORE YOU.

THE MUSKEGON IMPROVEMENT CO., composed of leading citizens, have just commenced their **2nd Great Lot Sale. 2,000 Lots** at the uniform price of **$165 each,** location to be determined by allotment as soon as 50 per. cent. is paid in. **Terms of Subscription:** $15 down, balance $10 each month. $165 secures you a good lot, 50x125 feet, with alley in rear, in the phenomenal addition **"MUSKEGON HEIGHTS,"** which addition is pronounced by Real Estate Experts to be as fine an addition as any city in this country can show. It is less than one and one-half miles from the business center of the City of Muskegon, with which it is connected by handsome, paved streets and an Electric Street Railway. This addition has twelve **large** factories located upon it **now**; has good Hotel, Brick Blocks and Stores, Depot, three paved streets, a large number of good residences. Every lot is level and desirable. **There is not a lot on the addition worth less than the price asked.** The net avails of this sale to be used to locate ten more factories. All the factories on Muskegon Heights are solid, substantial brick structures, the smallest is 50x150 feet, 2 stories; the largest plant is two buildings, each 60x400, one 2 stories, the other 3 stories high; the latter plant is owned by four Bank Presidents and is the largest factory of its kind in the world. **DON'T MISS THIS OPPORTUNITY. Such chances for sure paying investment are rare.**

If you wish to subscribe, remit by Money Order, P. O. or Express, or Bank Draft, to

F. H. HOLBROOK, Sec'y Board of Trade, or

HOLBROOK & McDONALD, SALES AGTS.,

MUSKEGON IMPROVEMENT CO.

REFERENCES: Any Bank in the City of Muskegon. Send for Maps, Plats and Information.

EDISON GENERAL ELECTRIC COMPANY,

EDISON BUILDING, BROAD ST., NEW YORK.

Electric Lighting.	Electric Motors.	Electric Railways.	Electric Drills.
INCANDESCENT AND ARC. SAFEST AND BEST LIGHT IN USE.	FOR ALL POWER PURPOSES. SAFE AND RELIABLE.	PASSENGER TRAMWAYS. MINE HAULAGE.	PERCUSSION AND DIAMOND, FOR MINING.

Address Nearest District Office.

DISTRICT OFFICES:

CANADIAN DISTRICT, Bank of Commerce Building, Toronto, Ont.
CENTRAL DISTRICT, 173-175 Adams St., Chicago, Ill.
EASTERN DISTRICT, Edison Bldg., Broad St, New York.
NEW ENGLAND DISTRICT, 25 Otis St., Boston, Mass.
PACIFIC COAST DISTRICT, Edison Bldg., 112 Bush St., San Francisco, Cal.
PACIFIC NORTHWEST DISTRICT, Fleischner Bldg., Portland, Ore.
ROCKY MOUNTAIN DISTRICT, Masonic Bldg., Denver Col.
SOUTHERN DISTRICT, Gould Bldg, 10 Decatur St., Atlanta, Ga.

THE GARFIELD INJECTOR CO.,

WADSWORTH, O.,

—MANUFACTURERS OF—

The Garfield Double Jet Injector.

THE GARFIELD
- Locomotive Injector,
- Automatic Injector,
- Double Jet Injector

AND

Ejector.

Strong, Carlisle & Turney,
General Agents,
CLEVELAND, O.

IRON CLAD PAINT CO.

Factory, 75 & 77 Central Way. Sec. & Treas., No. 3 Case Build'g.
CLEVELAND, OHIO.

Trade Mark Patented.

ORDER DIRECT FROM THE **Iron Clad Paint Co.**

And get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green, and now owned by this Company.

IRON CLAD PAINT is the most durable, most fire-proof and cheapest Paint made.

FURNISHED both Dry and Ground in Oil.

USED BY NEARLY ALL THE RAILROADS

HAS YOUR WAREROOM BEEN ROBBED?

Our corrugated or plain Iron or Steel **SHUTTERS** and **DOORS** will render it Fire and Burglar Proof. We also cover wooden shutters and doors with flat painted sheets, either plain or with corduroy corrugations. For prices, etc, address

The Cincinnati Corrugating Company,

BOX 320. **PIQUA, O.**

MUNN & CO. SCIENTIFIC AMERICAN AGENCY for **PATENTS**

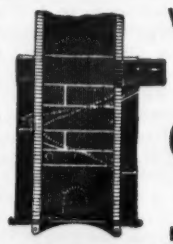
A pamphlet of information and abstract of the laws, showing How to Obtain Patents, Caveats, Trade Marks, Copyrights, *sent free.* Address MUNN & CO. 361 Broadway, New York.

GRANULATED RAW BONE

For Case Hardening and Coloring

For samples, prices, etc., apply to

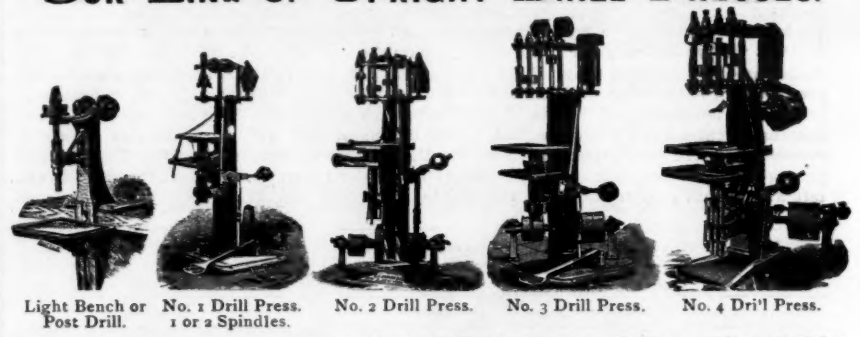
THE ROGERS & HUBBARD CO., Middletown, Ct.



VICTOR COLLIAU,
Sole Manufacturer of the
Improved Patent
HOT BLAST
COLLIAU CUPOLA
ADDRESS:
287 Jefferson Ave..
DETROIT, - MICH.

The Dunnning Boiler,
OLDEST AND BEST FOR
STEAM and HOT WATER HEATING.
Over 16,000 in use.
Also Steam Engines and Boilers of all kinds and Machinery generally. Manufactured at the
N. Y. CENTRAL IRON WORKS.
80 EXCHANGE ST., GENEVA, N. Y.

OUR LINE OF UPRIGHT DRILL PRESSES.



Light Bench or Post Drill. | No. 1 Drill Press. 1 or 2 Spindles. | No. 2 Drill Press. | No. 3 Drill Press. | No. 4 Dri'l Press.

THE GARVIN MACHINE COMPANY

Manufacturers of, and Dealers in, all kinds of

Machinery and Machine Tools.

Universal and Plain Milling Machines, Drill Presses, Screw Machines, Hand and Engine Lathes, Planers, Profilers, Chucking Machines, Gear Cutters, Die and Cutter Grinders, Tapping Machines, Wire-Spring Coilers, Milling Cutters, etc.

Plants for Manufacturers of Sewing Machines and Electrical Goods.

GEAR CUTTING AND MILLING IN ALL ITS BRANCHES.

Laight & Canal Sts., [Catalogue sent on Application.] **NEW YORK.**

COPELAND & BACON.

HOISTING & WINDING ENGINES

ORE CRUSHERS, ORE WASHERS, CONCENTRATING MACHINERY, GRAVITY INCLINES, STONE CRUSHERS, RAILROAD CRANES.

85 LIBERTY ST., NEW YORK. 535 ARCH ST., PHILADELPHIA

S. T. W. Ejector.

For Raising Water from Deep Wells, Streams, Excavations, &c.

The cheapest made. Send for prices

JAMES JENKS,
Manufacturer,
DETROIT, MICH.
M. P. SATTERTHWAITE, Agt., Cleveland, O.

Patent Milled or Turned Shafting

Is rapidly coming to the front. Made only by

The Brightman Machine Co.

CENTER ST. FROM MAIN TO WINSLOW,
CLEVELAND, O.

DON'T USE poor printing when you can get the best at the same prices, of the CLEVELAND PRINTING & PUBLISHING CO., Cleveland, O

CATALOGUES

Printed in the Highest Style of Art, by
The Cleveland Printing & Publishing Co.,
Cleveland, O.

CLEVELAND ROLLING MILL CO.,

MANUFACTURERS OF

BESSEMER STEEL RAILS,

Blooms and Billets, Steel Angles, Forgings, Bar and Spring Steel. Steel Street Rails, Steel Oil Barrel Hoops, Wire of all Kinds, Iron and Steel Boiler Plates, Galvanized and Black Sheet Iron, Corrugated Iron Roofing, Sheet Steel.

IRON AND STEEL MARKETS.

PIG IRON.

CLEVELAND (f. o. b. cars, net cash) Bessemer, $17 30; No. 1 Foundry, $16 80; No. 2 Foundry, $15 80; No. 1 Gray Forge, red short, $14 80; No. 2 Gray Forge, neutral, $14 30; No. 1 American Scotch, $16 80; No. 2 American Scotch, $15 80.

CHICAGO (reported by Messrs. Rogers, Brown & Merwin): Southern Coke No. 1. foundry, $16 25@17 00; Southern Coke No. 2 Foundry, $15 25@16 00; Southern Coke No. 3 Foundry, $14 75@15 50; Southern Coke No 1, Softeners, $15 25@16 00; Southern Coke No. 2, Softeners, $14 50@15 25; Ohio Silveries No. 1, $17 50@18 50; Ohio Silveries No. 2, $16 50@ 17 50; Ohio Strong Softeners No. 1, $18 00@19 00; Ohio Strong Softeners No. 2, $17 25@18 25; Lake Superior Charcoal Nos. 1 to 6, $17 75@18 50; Tennessee Charcoal No. 1, $18 00@19 00; Tennessee Charcoal No. 2, $17 00@18 00; Southern Standard Car Wheel, $21 00@23 00; Tennessee Standard Car Wheel, $00 00@00 co.

CINCINNATI (reported by Rogers, Brown & Co.): FOUNDRY IRONS—Southern Coke, No. 1 foundry, $14 75@15 25; Southern coke, No. 2 and No. 1 soft, $13 75@$14 00; Hanging Rock Coke, No. 1 foundry, $16 50@17 50; Jackson Co. Stone Coal, No. 1 foundry, $16 50@17 00; Tennessee Charcoal, No. 1 foundry, $16 50@17 50; Hanging Rock Charcoal, No. 1 foundry, $20 00@22 00. MILL IRONS—Standard Southern Coke, grey forge, $12 50@12 75; Standard Southern Coke, mottled, $12 25@12 50; Cold Short Southern Coke, grey forge, $12 75@13 00; Strong Ohio Neutral Coke, grey forge, $15 00@15 50. CAR WHEEL AND MALLEABLE—Standard Alabama Car Wheel, $19 50@20 50; Tennessee Car Wheel, $18 00@19 00; Lake Superior Car Wheel, $19 50@20 50.

BUFFALO (reported by Rogers, Brown & Co.): Mahoning and Shenango Valley strong, No. 1 Foundry, $.6 50@00 00; Mahoning and Shenango Valley strong, No. 2 Foundry, $15 50@00 00; Ohio Softener No. 1, $16 50@00 00; Ohio Softener No. 2, $15 50@00 00; Jackson Co., Silvery No. 1, $18 00@00 00; Jackson Co. Silvery, No. 2, $17 00@00 00; Lake Superior Charcoal, $18 50@00 00; Tennessee Charcoal, $17 50@19 00; Southern Softener No. 1, $16 00@00 00; Southern Softener No. 2, $15 25@00 00; Southern Strong No. 1 Foundry, $16 75@00 00; Southern Strong No. 2 Foundry, $16 00@00 00· Alabama Car Wheel, $22 00@22 50; Hanging Rock Charcoal, $23 00@24 00.

LOUISVILLE (reported by Hall Bros. & Co.) HOT BLAST FOUNDRY—Southern coke No. 1, $14 25@14 50; Southern coke No. 2, $13 50@14 00; Southern coke No. 3, $13 00@13 25; Mahoning Valley (Lake ore mixtures), $00 00@00 00; Southern charcoal, No. 1, $16 00@17 00; Southern charcoal, No. 2, $15 50@16 00; Missouri charcoal, No. 1, $17 00@17 50; Missouri charcoal, No. 2, $16 50@17 00. FORGE—Neutral coke, $12 50@12 75; Cold short, $12 25@12 50; Mottled, $11 75@12 00 CAR WHEEL AND MALLEABLE—Southern (standard brands), $19 00@19 50; Southern (other brands), $17 00@18 00; Lake Superior, $20 00@21 00.

ST. LOUIS (reported by Rogers, Brown & Meacham): HOT BLAST COKE AND CHARCOAL—Southern Coke No. 1, $15 50@15 75; Southern Coke No. 2, $14 50@14 75; Southern Coke No. 3, $13 75@14 00; Southern Grey Forge, $13 25@13 50; Southern Charcoal No. 1, $17 25@17 75; Southern Charcoal No. 2, $16 75@1 25; Missouri Charcoal No. 1, $15 50@16 00; Missouri Charcoal No. 2, $15 00@15 50; Ohio Softeners, $18 00@19 00. CAR WHEEL AND MALLEABLE IRONS—Lake Superior, $19 50@20 00; Southern, $19 50@20 00. CONNELLSVILLE COKE—East St. Louis, $0 00; St. Louis, $5 65

DETROIT (reported by William F. Jarvis & Co.): Lake Superior Charcoal, all Numbers, $18 00@18 50; Lake Superior (coke) Bessemer, $17 75@18 50; Katahdin (Maine charcoal), $00 00@00 00; Lake Superior Coke, Foundry, all ore, $17 50@18 00; Lake Superior Coke, Foundry, all ore, $00 00@00 00; Standard Ohio Black Band, $18 00@18 50; Southern No. 1 $16 25@16 50; Southern Gray Forge, $14 00@14 50; Jackson County (Ohio) Silvery, $18 00@18 50; Old Car Wheel, $00 00@00 00. Connellsville Coke, $0.00.

LOUISVILLE (reported by Geo. H. Hull & Co.: Southern Coke No. 1 Foundry $14 50@15 00; Southern Coke No. 2 Foundry $13 75@14 25; Southern Coke No. 3 Foundry $13 25@13 75; Grey Forge, $12 75@13 25; Southern Coke Silver Grey, $00 00@00 00; Southern Charcoal No. 1 Foundry, $16 00@17 00; Car Wheel, $18 50@20 00.

PITTSBURGH (reported by A. H. Childs): No. 1 Foundry, $1· 00@16 25; No. 2 Foundry, $15 00@15 25; Grey Forge, $13 75@14 00; White and Motled, $13 2·@13 50; Warm Blast Charcoal, $18 00@20 00; Cold Blast Charcoal, $22 00@27 00; Bessemer, $15 50@16 00.

MERCHANT IRON AND STEEL.

Flat Bar

1½ to 4 by ⅛ to 1 inch	1 80
4½ to 6 by ⅛ to 1 inch	1 90
1½ to 6 by 1½ to 2 inch	2 20
1½ & 1¾ by ⅛ to ¼ inch	1 90
1 & 1¼ by ⅛ to ¼ inch	2 00
⅝, ¾ and ⅞ by ⅛ to ⅝ inch	2 20

Round and Square.

1 to 1⅞ inch	1 80
2 to 2¾ inch	2 00
2¾ to 3¾ inch	2 10
3¾ to 4 inch	2 80
4¼ to 4½ inch	3 30
4¾ to 5 inch	3 50

Oval.

⅜ to 1¼ inch	2 20
⅜ to ¾ inch	2 40
⅞	2 60
¾	3 00

Half Oval and Half Round.

1¼ to 3 inch	2 90
⅜ to 1¼ inch	2 50
⅓ to ¾ inch	3 10
¾	3 30
⅞	4 80

Heavy Band.

¼ to 6 by ¼ and 5-16 inch	2 00
¾ to 1¾ by ¼ and 5-16 inch	2 10
¼ to ¾ by ¼ and 5-16 inch	2 30
to 4¼ by ¼ and 5-16 inch	2 80

Hoops.

1¾ to 4, Nos. 13 to 15	2 60
1¾ to 3, Nos. 16 to 18	2 70
1¾ to 3, No. 19	2 80
1¾ to 2, No. 20	2 90
1¾ to 3, No. 21	3 00
1¾ to 2, No. 22	3 10
15-16, 1 and 1⅛, Nos. 13 to 15	2 80
15-16, 1 and 1⅛, Nos. 16 to 18	2 90
15-16, 1 and 1⅛, Nos. 19 and 20	3 00
15-16, 1 and 1⅛, No. 21	3 10
15-16, 1 and 1⅛, No. 22	3 20
⅞, Nos. 13 to 15	3 00
⅞, Nos. 16 to 18	3 10
⅞, Nos. 19 and 20	3 20
⅞, No. 21	3 30
⅞, No. 22	3 40
13-16, Nos. 13 to 15	3 20
13-16, Nos. 16 to 18	3 30
13-16, Nos. 19 and 20	3 40
13-16, No. 21	3 50
13-16, No. 22	3 60
¾, Nos. 13 to 15	3 30
¾, Nos. 16 to 18	3 50
¾, Nos. 19 and 20	3 60
¾, No. 21	3 70
¾, No. 22	3 80
11-16, Nos. 13 to 15	3 50
11-16, Nos. 16 to 18	3 70
11-16, Nos. 19 and 20	3 80
11-16, No. 21	3 90
11-16, No. 22	4 00
⅝, Nos. 13 to 15	3 80
⅝, Nos. 16 to 18	4 00
⅝, Nos. 19 and 20	4 10
⅝, No. 21	4 20
⅝, No. 22	4 30
⅝, No. 23	4 50

Light Band.

1¼ to 6 by ⅛ to 3-16 in	2 20
1½ to 6 by Nos. 11 and 12	2 30
1 to 1¾ by ¼ to 3-16 in	2 40
1 to 1¾ by Nos. 11 and 12	2 50
⅞ and 13-16 by ⅛ to 3-16 in	2 70
⅞ and 1 3-16 by Nos. 11 and 12	2 80
¾ and 11-16 by ⅛ to 3-16 in	3 00
¾ and 11-16 by Nos. 11 and 12	3 10
⅝ and 9-16 by ⅛ to 3-16 in	3 30
⅝ and 9-16 by Nos. 11 and 12	3 40
½ by ⅛ to 3-16 in	3 60
½ by Nos. 11 and 12	3 70

Wagon Box Iron.

⅜ inch, beveled edge, by Nos. 11 and 12	2 80
⅜ inch, " " " 13 and 14	3 00
¼ inch, " " " 11 and 12	3 10
¼ inch, " " " 13 and 14	3 30

Sheet Iron.

No. 10 to 14	2 65
No. 15 to 17	2 75
No. 18 to 21	2 99
No. 22 to 24	3 15
No. 25 to 26	3 30
No. 27	3 40
No. 28	3 50

Iron Boiler Plates.

Tank, ¼ inch and heavier	2 60
C No. 1, " "	2 85
C H No. 1 " "	3 10
C H Flange, " "	3 85
Extra Flange, "	4 85
Solid Fire Box "	3 10

Steel Boiler Plates—1-4 in. and Heavier.

Tank	2 75
Shell	3 15
Flange	3 45
Marine Flange	3 85
Fire Box	4 55

Above includes plates 90 inches wide.

90 to 96 in. wide	½c lb extra
96 to 100 in. wide	1 c "
100 to 104 in. wide	1½c "
104 to 116 in. wide	special

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts. lbs
1 to 2 in. inclusive	09
9-16 to ⅞ in "	09
7-16 to ⅝ and 2⅜ to 3 in	10⅝
3⅛ to 4 in	11
⅝ to 11-16 and 4⅛	10⅝
⅝ to 6 in	11⅛
¼ to 9-32 and 6⅛ to 7 in	12
3-6 in	14

Flats.

	cts. lbs
2 to 9-16 wide by 2 to ⅝ thick	9

Bessemer and O. H. Steel.

Machinery base price,	2 75
Tire "	2 75
Spring "	3 25
Sleigh Shoe "	2 75
Toe Calk "	3 00
Cutter Shoes, tapered and burr. "	3 00

English Tool Steel.

Jessop's	16c
Hobson's "Best"	16c
" "Choice"	16c

Burden Boiler Rivets.

⅛, ⅜, 11-16 and ¾ inches diameter	4 00
Bridge ⅛, ⅜, 11-16 and ¾ inch diam	4 00

SCRAP IRON AND OLD METAL.

NET TONS	
No. 1 R. R. wrought scrap	$18 00
No. 1 wrought scrap	16 50
No. 1 Machine cast scrap	11 50
Iron axles	23 50
Axle turnings	13 50
Wrought turning (free from cast)	11 50
Cast borings	8 00
Uncut wrought iron boilers	11 50
Steel boiler plates	16 00
Grate Bars	8 00
Pipes and flues (Clean)	12 00
Tank iron	12 50
Hoop and band iron	9 50
Sheet iron	8 50
Wrought drillings	11 00
Malleable iron	9 50

Reported by Messrs. BLACK & POLLOCK, Cincinnati, O.:

Railroad Wrought	$20 00
No. 1 Country Wrought	17 00
Stove Plate	8 75
Machine Castings	11 00
Hoop and Sheet	8 00
Casting Borings	9 00
Wrought Turnings	00 00

THE CAMBRIDGE IRON & STEEL CO.

MANUFACTURERS OF

SHEET IRON AND SHEET STEEL

CAMBRIDGE REFINED IRON. TRADE MARK

Squared Roofing Sheets a Specialty.

CAPACITY RANGES FROM No 30 TO 26 INCHES WIDE TO 1·4×40×120

CAMBRIDGE SOFT STEEL. TRADE MARK

CORRESPONDENCE SOLICITED

OFFICE AND WORKS CAMBRIDGE, OHIO.

FOR SALE---BLOWING ENGINE.

Vertical pattern, with balanced steam slide valve gear, steam cylinder 14-in. diameter, air cylinder 40-in. diameter, stroke 24 in., 1 to 190 strokes per minute; engine new. For price and particulars address THE JAMES LEFFEL & CO., Springfield, O.

FOR SALE.

1 $250 BOND - First-Class Security.

Bearing 8 per cent., pavable semi-annually.

WANT TO REALIZE AT ONCE. ADDRESS,

W. N. C.,

Room 1, 29 Euclid Ave., CLEVELAND, O.

DALLIBA, CORRIGAN & CO.,

DEALERS IN

Iron Ore & Pig Iron,

Rooms 716. 717. 718, 719 Perry-Payne Bld'g.

CLEVELAND, O.

PITTSBURGH & WHEELING COAL CO.,

MINERS AND SHIPPERS OF

Ohio Steam Coal and Coke.

Mines on the Cleveland, Lorain & Wheeling R. R. Capacity, 3,000 tons daily.

Office, 6 Mercantile Bank Building,

CLEVELAND, OHIO.

Lake Shipping Point. Lorain O.
JAS. PATTERSON, Sales Agent.

OGLEBAY, NORTON & CO.

Successors to Tuttle, Oglebay & Co.,

Commission Dealers in

Iron - Ores,

FROM MARQUETTE, GOGEBIC AND MENOMINEE DISTRICTS,

CLEVELAND, OHIO.

ESTABLISHED 1854.

PETER GERLACH & CO.,

MAKERS OF

Saws, Tools and Machinery.

Office and Warerooms, 28 Columbus st. Factories on Columbus, Winter and Leonard streets.

Cleveland, O., U. S. A.

J. H. OUTHWAITE. W. G. POLLOCK.

J. H. OUTHWAITE & CO.,

Exclusive attention given to

LAKE SUPERIOR AND MENOMINEE RANGE

Iron Ore,

Perry-Payne B'ld'g. Cleveland, O.

THE CONDIT-FULLER CO.,

Pig and Bar Iron,

CLEVELAND, OHIO.

E. C. POPE,

COMMISSION DEALER IN

Iron Ore, Pig Iron

AND METALS.

Cleveland, - Ohio.

Sam'l. L. Matnes, Prest. & Treas. Fred. A. Morse, Sec'y.

Cleveland Iron Mining Co.,

Dealers in Iron Ores

from their own mines near Marquette, Lake Superior.

Rooms 4 & 5 Mercantile Bank Building,

CLEVELAND O.

DESKS.

BANK, RAILROAD

—AND—

OFFICE + FURNITURE.

Interior Work a Specialty.
Send for Illustrated Catalogue.

THE CLEVELAND DESK CO.

97-99 Ontario St., - - Cleveland, Ohio.

MACHINERY SUPPLY MARKET.

Anvils.

American ..... ₩ lb @12
Wrights ..... ₩ lb 12

Bellows.

Blacksmiths' { Hill's ..... dis 40
Bullock's .... dis 50&10
Moulders' ..... dis 40@40&10
Hand ..... dis 40&10@50

Belting.

Boston Belting Co's standard ..... dis 70
" " " extra ..... dis 60&5
" " " best ..... dis 55
Hoyt's Short Lap ..... dis 45
Cleveland Rubber Co. extra standard dis 60&10
Shults Raw Hide Leather Belting, single, ... dis 40
Shults Raw Hide Leather Belting, double, and Light Double ..... dis 40
Standard, oak tanned ..... dis 50&10
Alexander Brothers' pure oak tanned. ... dis 45

Blowers and Exhausters.

S. F. Sturtevant's ..... dis 20
Boston Blower Co., ... dis 35
Buffalo ..... dis 25

Borax.

..... ₩ lb 12

Chalk.

White ..... ₩ gross 50
White Crayon ..... ₩ gross 12@12½ dis 10
Red ..... dis 70
Blue ..... dis 85

Chucks.

Cushman's 4 Jaw Independent ..... dis 45
" Combination ..... dis 40
" Geared Scroll ..... dis 30
" 3 Jaw Brass Workers ..... dis 30
" Drill ..... dis 35
Wescott's Scroll Combination ..... dis 33⅓
" Independent ..... dis 40
" Little Giant Drill ..... dis 30
Horton's Universal ..... dis 40
" Independent ..... dis 45
Whiton's Independent ..... dis 45
National Combination ..... dis 40
Sweetland " ..... dis 40
Almond Drill ..... dis 20
Morse " ..... dis 15
Skinner's Combination Lathe ..... dis 33⅓
" Independent Lathe ..... dis 40
" Universal Lathe ..... dis 40
" Drill ..... dis 15

Cutters and Reamers.

Cleveland ..... dis 10@15
Pratt & Whitney ..... dis 10@15
Standard ..... dis 10@15
Brown & Sharpe, Milling Cutters ..... dis 15
" Gear Cutters ..... dis 15

Crowbars.

Cast Steel ..... ₩ lb 4
Iron, steel points ..... ₩ lb 3½

Drill and Drill Sockets.

Twist drills ..... dis 50&10
Morse Taper and Straight shank to 1¾" ..... dis 50&10
Morse Taper and Straight shank Larger than 1¾" ..... dis 25
Drill Sockets ..... dis 25
Standard Twist Drills ..... dis 55@55&5
Cleveland " " ..... dis 55@55&5

Emery.

	No. 4 to 46 gr.	No. 54 to 150. gr.	Flour, F.	C. F. FF.
Kegs, ₩ lb	4 c	5 c		2½c
¼ kegs ₩ lb	4½c	5½c		2¾c
¼ kegs ₩ lb	4½c	5½c		3 c
10 lb cans, 10 in case	6 c	6½c		5 c
6 lb cans, less than 1	10 c	10 c		7½c

Emery Cloth and Paper.

Sarder, Adamson & Co. ..... dis 45@50
H. H. Barton ..... dis 50@50&10

Emery Wheels.

Detroit ..... dis 55@60
Norton's ..... dis 55@60
Grant ..... dis 55@60
Sterling ..... dis 60
Celluloid ..... dis 10&33⅓
Northampton ..... dis 55
Crystal ..... dis 65@70
Vitrified ..... dis 60
Vulcanite ..... dis 10&10

Files.

Nicholson ..... dis 60&10@60&10&10
" X. F ..... dis 25
Kearney & Foot ..... dis 60&10@60&10&10
Black Diamond ..... dis 60&10@60&10&10
Arcade ..... dis 60&10@60&10&10
Disston's ..... dis 65@70
Western ..... dis 70
Stub's ..... dis 25
Grobet's ..... dis 30
Reynolds Bros.' Hand Cut ..... dis 50
ndustry File Works, hand cut ..... dis 50

Hammers.

P. S. W ..... dis 40
Atha new list, Jan. 15, 1887 ..... dis 50
Heavy hammers and sledges under 5 lbs. 18c over 5 lbs 14c, new list.

Jack Screws.

Illinois Bolt Co. list ..... dis 70

Nuts and Washers.

Size of bolt inches	⅜	5-16	⅜	½	⅝	¾	⅞	1
Square	8	7	5½	4½	4	3½	3¼	
Hexagon	15½	11½	8½	6	5½	5½	5	
Washers	9	8	7	5	4½	4½	4½	

In lots less than 100 lbs, ₩ lb add ½c., 1lb boxes add 1c to list.

Nails (wire.

List July 14, 1887 ..... dis 70 &10
Standard Penny Nails, ₩ keg card rate
{ Car lots $2.30
{ Less than car lots $2.40

Oilers.

Zinc and Tin ..... dis 60
Brass and Copper ..... dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₩ doz ..... dis 10@10&10

Packing, Steam.

Boston Belting Co. ..... dis 60
American Packing Hemp ..... ₩ lb 10@11
Russia Packing " ..... ₩ lb 14
Italian Packing " ..... ₩ lb 12@14
Plumbago Piston ..... ₩ lb 40
Morrison's " ..... ₩ lb 50
Square Flax " ..... ₩ lb 50
Sheet Rubber ..... ₩ lb 12&24
Excelsior Rubber ..... lb 1.48

Picks.

Railroads, 5 to 6 lbs ..... $12 dis 60
" 6 to 7 lbs ..... $13 dis 60

Pulleys.

Iron Pulleys, Walker List ..... dis 45
Medart Pulleys ..... dis 55
Split Wood Pulleys ..... dis 50@55

Rivets.

Iron, Thousand, list November 17, ... dis 50
Iron, Ordinary, Cooper's Block and Carriage list November 17 ..... dis 50
Copper ..... dis 50@50&10

Rope.

Manilla, ¾ inch and over ..... ₩ lb 13¾
Sisal, ¾ inch and over ..... ₩ lb 13½

Sand Paper.

B. A. & Co ..... dis 45@50
H. H. Barton's ..... dis 40@45
New England Flint ..... dis 40@50
Barton's Garnet ..... dis 20

Saws.

Disston's Circular ..... dis 40@10
" Band ..... dis 20
" Scroll ..... Net
Hack Saw Stubs ..... dis 20
" " Eureka ..... dis 20
" " Star ..... dis 20
Saw Swages Disston's ..... dis 30
Atkins' Circular Saws ..... dis 40&45
" Mill, Mulay and Drag Saws dis 40&10
" Wood Saws ..... dis 40&10
" Silver Steel Diamond Cross-cut Saws ..... dis 70c per ft
" Dexter Cross-cuts ..... dis 50c "
" Diamond " ..... dis 50c "
" Tuttle Tooth Cross-cuts dis 25c "
" One-man Cross-cuts ..... dis 32c "
No. 1 Handles ..... dis 23c per pair
No. 6 " ..... dis 16c "
Excelsior Saw Tools ..... $6 per doz
Perfection " ..... $15 "
Detroit Saw Works, Circular ..... dis 50
" " " Band ..... dis 25
" " " Mulay ..... dis 45

Screws.

Wood Screws—New List 1890.

Flat head iron ..... dis 72½
Round head iron ..... dis 67½
Flat head brass ..... dis 72½
Round head brass ..... dis 65
Square Cap ..... dis 65
Hexagon Cap ..... dis 60
Set C. H. C. P ..... dis 70
Machine, flat head, iron ..... dis 65
Machine, round head, iron ..... dis 60
Bench and hand—
Lag or coach ..... dis 75@75&10
Coach, patent gimlet point ..... dis 75

Shovels and Spades.

Ames' list November 1, 1885 ..... dis 30
Dennis ..... dis 5 2
Hussey & Binns, railroad ..... dis 8.0

Taps.

Cards, Hand and Nut to 2 in ..... dis 50
Carpenters' " " " ..... dis 50
Morse " " " ..... dis 50
Pratt & Whitney " " new list dis 10
Machine Screw Taps ..... dis 55
Pipe Taps to 2¾ in ..... dis 70
Stay Bolt Taps ..... dis 25
Stove Bolt Taps ..... dis 50
Pulley Taps ..... dis 40

Twine.

	BC.	B.
No. 12, Flax Twine, ¼ and ⅛ lb Balls	21c@29c	
No. 18 " " ¼ and ⅛ "	18c@28c	
No. 36 " " ¼ and ⅛ "	16c@27c	
2-Ply Hemp, ¼ & ⅛ lb Balls (Spring Twine)	11½c	
3-Ply " 1 lb Balls	12@12½c	
3-Ply " 1½ lb Balls	11@11½c	
Cotton Wrapping, 5 Balls to lb	15@16c	

Vises.

Solid Box ..... dis 60
Parker's ..... dis 20@25
Prentiss ..... dis 20
Stephen's ..... dis 25@30
Barrett's ..... dis 30
Miller's Falls ..... dis 40
Merrill's ..... dis 15@20
Howard ..... dis 35

Wire.

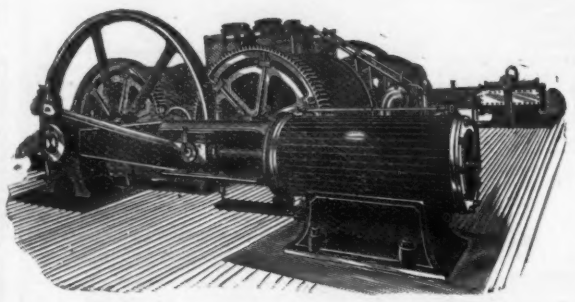
New List, Jan. 18, 1884

Brass and copper ..... dis 20@25
Bright and annealed, Nos. 0@18 ..... dis 70&10@75
" " Nos. 19@26 ..... dis 75@75& 5
" " Nos. 27@36 ..... dis 75&10& 5
Coppered Nos. 0 to 18, market list ..... dis 70@70& 5
Galvanized Nos. 0 to 18 " " ..... dis 65&5
Tinned market Nos. 0 to 18 ..... dis 67½
Cast steel ..... dis 50
Tinned Broom Wire ..... dis 70&5@70&10
Annealed Fence, Nos. 8 and 9 ..... dis 75
Annealed Grape, Nos. 10 to 14 ..... dis 75
Stub's Steel Wire, regular ..... $6.00@lb dis 5

Wrenches.

Coe's genuine, ... dis 50
Girard Standard ..... dis 70&10
Agricultural ..... dis 75&10
Mechanics' ..... dis 55&10,& 3
Bemis & Call's Combination ..... dis 35
Donohue's Engineers ..... dis 20&10
Lamson & Sessions Engineers ..... dis 60
Billings & Spencer's Drop Forged ..... dis 25
William's " " ..... dis 25
Alligator " " ..... dis 50

Webster, Camp & Lane Machine Co.



MANUFACTURERS OF

Mining Machinery,

Improved Band Friction Hoisting Machinery, Geared or Direct Acting, for round or flat rope.

Wire Rope Haulage Machinery,

Endless or Tail Rope Systems.)

CORNISH PLUNGER AND BUCKET LIFT PUMPS.

Automatic or Slide Valve Steam Engines, Sheaves. Cages, Buckets, Etc.

Send for Catalogue D. 134 N. Main St., AKRON, OHIO.

TIME IS MONEY!

SAVE TIME AND MONEY BY USING OUR SPECIALTIES.

OUR **Time Stamps** A M

Mark the hour and minute, the day, month and year, by one impression.

Useful, Economical, Ornamental.

PRINTED MATTER ON APPLICATION.

OUR **Time Registers**

Record the hour and minute of the arrival and departure of employes by their own act, in their own handwriting.

Indispensable for employers and just to employes.

THE AUTOMATIC TIME STAMP AND REGISTER COMPANY

No. 71 Sudbury St., Boston, Mass., U. S. A.

THE THOS. D. WEST FOUNDRY. CO.

CLEVELAND. O.

LIGHT AND HEAVY

IRON CASTINGS.

DAILY MELTING CAPACITY 75 TONS-SPECIAL FACILITIES FOR ECONOMICALY TURNING OUT SMOOTH CLEAN CASTINGS.

DUPLICATE WORK A SPECIALTY

F. A. SACKMANN,
125 Champlain Cleveland, O.

Steel Name Stamps (1-16, 3-32 or ¼ inch letters, 15c. per letter

SECTION OF CONVEYOR.

Detachable Roller and Chain Belting,

CHAIN

MADE IN ALL SIZES OF

Malleable Iron and Steel,

DESIGNED FOR

Elevators, Conveyors, Drive Belts, etc.

For handling materials of all kinds.

Send for Illustrated Catalogue. Address

The Jeffrey M'f'g Co.,

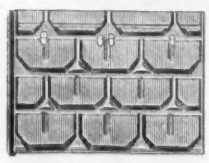
183 East 1st Ave.,

COLUMBUS. O.

Chicago Office, 48 S. Canal St.

Eastlake Metallic Shingles.

Unequaled for ROOFING AND SIDING.



Manufactured by W. J. BURTON & CO.'s Galvanized Iron Cornice Works, Detroit, Mich.

Send for illustrated catalogue and prices.

Mention this paper.

UNION ELECTROTYPE FOUNDRY

TELEPHONE 2139

829 SHERIFF ST. CLEVELAND O

THE INDISPENSABLE LATHE DOG.

THE INDISPENSABLE LATHE DOGS can be attached to work after the work is centered in the lathe. They can be used equally as well BETWEEN COLLARS as upon plain or straight work.

DROP FORGED FROM BAR STEEL.

No. 1 takes from ¼ to 1¾ inches, price, each $1 50
" 2 " ½ to 2¼ " " 2 50
" 3 " 1 to 3¼ " " 3 50
Price, per set of three, to take from ¼ to 3¼ in. 7 50

PALMER, CUNNINGHAM & CO., L't'd,
607 Market St., PHILADELPHIA, PA.

IRON FOUNDRY CANTON IRON FOUNDRY CO.,
Canton, Ohio.
HEAVY AND LIGHT CASTINGS.
Privilege to make estimates solicited.

HARDWARE MARKET.

Augers and Bits.

Common augers and bits.....dis 70
Snell's.....dis 60&5
Cook's Douglass Mfg. Co.....dis 55
Russell Jennings' augers and bits.....dis 25
Expansive Bits, Clark's small, $18; large, $26.....dis 35@35&5
Hollow Augers, Ives'.....dis 25&10
Hollow Augers, Bonney's Adjust. ℔ doz., $48.....dis 40&10
Hollow Augers, Stearns' Adjust. ℔ doz., $48.....dis 20&10
Gimlet bits, common.....per gross $3 25@4 00
Standard Bit Stock Drills.....dis 50&10&5
Ship Augers.....dis 15&10@15&10&5

Axes.

Makers' and Special Brands—
First quality.....℔ doz $7 00
Others.....℔ doz $6 00
Full polished.....℔ doz $8 00

Bolts.

Cast iron barrel bolts.....dis 70
Cast iron shutter bolts, etc.....dis 70
Cast iron chain bolts.....dis 65&10
Ives' patent door bolt.....dis 60
Wrought iron barrel bolts.....dis 70
Wrought iron square bolts.....dis 70
Wrought shutter bolts.....dis 60&10
Sargent's list
Carriage, common, new list.....dis 75&10
Tire, common, new list.....dis 65
Carriage and tire, Philadelphia pattern.....dis 75&10
Stove bolts.....dis 60
Plow bolts.....dis 60&5
Machine.....dis 75&10@80
Ends.....dis 75&10&80

Buckets, Elevator.

.....dis 50&10

Butts.

Wrought brass.....dis 75&10
Cast brass, loose joint.....dis 33⅓
Cast Iron—
Fast joint, narrow.....dis 50&10&5@60
Fast joint, broad.....dis 50&10@60
Loose joint.....dis 70&10
Loose joint, jap.....dis 70&10
Loose joint, jap. with acorns.....dis 70&10
Loose pin, acorns.....dis 70&10
Loose pin, japanned acorns.....dis 70&10
Loose pin, acorns, jap. plated tips.....dis 70&10
Wrought steel—
Wrought, fast joint, narrow.....dis 70&10
Wrought, fast joint, broad.....dis 70&10
Wrought, loose joint, broad.....dis 70&10
Table Butts, back flaps, etc.....dis 70&10
Regular inside blind.....dis 70&10
Light inside blind.....dis 70&10
Loose pin.....dis 70&10
Light loose pin.....dis 70&10

Carbonized Felt and Building Papers.

(POWERVILLE BRAND.)

	Per roll of 500 sq. feet.
Eberts Bros., Detroit.	
No. 1—Slaters'	$1.25
"A," Stringed Roofing, Light	1.50
"B," Stringed Roofing, Medium	1.75
"C," Stringed Roofing, Heavy	2.00
Stringed, Rosin-Sised	1.00

MILCELLANEOUS.

Asphaltum, Trinidad Refined, ℔ ton.....$30.00
Asphaltum, Fine Grade, ℔ ℔.....08
Coal Tar Felt, 1 Ply, ℔ ℔.....02
Coal Tar Felt, 2 Ply, ℔ roll 108 sq ft.....1.42½
Coal Tar Felt, 3 Ply, ℔ roll 108 sq ft.....1.85
Roofing Pitch, ℔ gal.....09

Chains.

Revised List.
Trace, 6¾-10-2.....℔ pair 1.03
Trace, 6¾-10-3.....℔ pair .92 .....50&10
Trace, 7-10-2.....℔ pair 1.11
German Halter Chain, list June, 1887...dis 50&10
German Coil, list of June, 1887.....dis 50&10@60
Galvanized Pump Chain.....℔ ℔5¾@6
Jack Chain, Iron.....dis 75&10
Jack Chain, Brass.....dis 75

Chisels.

Socket Framing and Firmer.....dis 75
Socket Framing and Firmer, Buck Bros..dis 30
Socket Firmer and Framing, L. & I. J. White.....dis 30@30&5
Tanged Firmers.....dis 40&10

Cutlery.

Table.....net
Excelsior Pocket.....net

Fibre Ware—Standard.

	Nos. 1	5.	5X.
Pails, water, 12 qt	$4 00	$4 50	$.....
Dairy, 14 qt	4 50	5 00	.....
Fire 12 qt	5 00	.....	.....
Sugar	6 00	6 50	.....
Horse	.....	5 00	.....
Buggy	4 00	.....	.....
Chamber, Slop, Commode } 5 and 5X 14 qt.	6 50	7 50	8 50
Fire slop, 5 and 5X 14 qt	8 00	9 00	10 00
Basins, wash—			
10½ inch	2 00	2 25	.....
12 inch	2 25	2 75	3 25
13½ inch	2 75	3 25	3 75
15 inch	3 25	3 75	4 25
Bowls, fruit	.....	2 50	.....
Servers, 12 in	.....	2 25	.....
Baskets, waste paper, 13 in	.....	6 00	.....
Spittons, "Daisy," pressed			
8 inch	4 00	4 50	5 00
10 and 11¾ inch	6 00	6 50	7 50

No. 1 plain; No. 5 decorated; No. 5X White decorated.

Gimlets.

Nail and Spike.....dis 50&10&5
Double cut, low list.....dis 25
"Bee".....℔ gross $12, dis 25@25&5

Hanger

Barn door, old patterns.....dis 60&10&10@70
Climax, (Anti-Friction).....dis 55
Scranton.....dis 33—
Kidder's.....dis 50&10@60
Terry's Patent.....5 in., $12; 4 in., $10, dis 50&5
Paragon.....dis 40&10
Richard's.....dis 30@30&10

Horse Nails.

No.	10	9	8	7	6	
Ausable, ℔ M	23	24	25	26	28	dis 40
Putnam, ℔ M	18	19	20	21	23	dis 15
Essex						dis 25&10

Horse Shoes.

Burden, at factory.....℔ keg $4 00
R. I. Horshoe Co., Perkins' Imp. at factory.....℔ keg $4 00
Mule Shoes, at factory.....℔ keg $5 00

Knobs.

Carriage, japanned.....℔ gross 80c dis 60&10
Base, rubber tip.....dis 70&10&5
Hemacite door knobs, new list.....dis 40&10@50
Door mineral.....dis 65c@68c
Door Por. japanned.....dis 75c@78c
Door Por. nickle.....$2 00@2 25
Door Por. plated.....$2 00@2 25

Locks, Bolts, Etc.

P. & F. Corbin, Locks and Bronze Goods.
Door locks, knobs and latches.....dis 60&10
Escutcheons and keys.....dis 60&10
Padlocks and padlock keys.....dis 75
Bell pulls, mineral, porcelain and jet dis 60&10
Bell pu'ls, genuine bronze.....dis 60&10
Lever bell pulls, genuine bronze.....dis 60&10
Butts', genuine bronze.....dis 60&10
Butts' bronze plated.....dis 60&10
Store door locks and latches.....dis 60&10
Store door handles.....dis 60&10
Shutter hinges&flaps, genuine bronze.dis 60&10
Shutter hinges, bronze plated.....dis 70
Flush bolts, genuine bronze.....dis 70
Shutter knobs. genuine bronze.....dis 50
Shutter bars, genuine bronze.....dis 60
Sash lifts, genuine bronze.....dis 60
Sash pulls and plates, genuine bronze.....dis 60
Push plates, genuine bronze.....dis 60
Drawer pull, genuine bronze.....dis 70
Letter box plates, genuine bronze....dis 60&10
Barn door locks.....dis 33⅓
Bishop's Buckeye Sash Locks.....℔ gross $4.80

Plumbs and Levels.

Standard list.....dis 70&10
Pocket levels.....dis 70&10
Davis' inclinometers.....dis 10&10

Pumps.

Cistern, best makers.....dis 50&10@60
Pitcher spout, best makers dis 60&10@60&10&10
Pitcher spout, cheaper goods.....dis 70@70&5

Pokes, Animal.

Bishop's I. X. L.....℔ dos $0 [illegible]
Bishop's O K.....℔ dos $3 [illegible]
Bishop's Pioneer.....℔ dos $3 75
Bishop's American.....℔ dos $2 [illegible]

Rakes.

Cast steel.....dis 70
Malleable.....dis 70@70&5

Razors.

J. R. Torrey Razor Co.....dis 2[illegible]
Wostenholme & Butcher.....$10@[illegible].....dis 1[illegible]
Rifle razor.....dis $9 50 net

Rat Killers.

Schuyler's.....℔ gross $15 00

Scales.

Hatch, Counter, No. 171.....℔ dos $2[illegible]
Hatch, Tea, No. 161.....℔ dos $6 75@7 [illegible]
Chatillon's Grocers.....dis [illegible]
Family Turnbulls.....dis 30@10&10
Scale Beams, List of January 12, 1882.....dis 50&10@50&10&4

Screw Drivers.

Stanley R. & L. Co.'s Varnished Handles.....dis 05&1[illegible]
Stanley R. & L. Co.'s Black Handles..dis 60&1[illegible]
Sets interchangeables.....℔ dos $18 dis 25

Squares.

Steel and iron, Nickel plated.....dis 75&10@80
Disston's try square and T bevels.....dis 45&10
Winterbottom's try and miter.....dis [illegible]

Tacks, Brads, Etc.

New List, Oct. 19, 1890.

American iron carpet tacks all kinds dis 77½&10
Steel carpet tacks all kinds.....dis 75&10
Swedes iron carpet tacks, all kinds dis 75&10
Swedes iron tacks.....dis 75&10
Swedes iron Upholsterers' tacks.....dis 75&10
Tinned Swedes iron tacks.....dis 77½&10
Tinned Swedes iron Upholsterers' tacks.....dis 77½&10
American iron cut tacks.....dis 77½&10
Copper tacks.....dis 40&10
Copper finishing and trunk nails.....dis 50&10
Cigar box nails.....dis 50&10
Finishing nails.....dis 60&10
Hungarian nails and miners' tacks...dis 60&10
Gimp and lace tacks.....dis 77½&10
" " " tinned.....dis 60&10
Trunk and clout nails.....dis 72½&10
Tinned trunk&clout nails.....dis 66&10
Basket nails.....dis 66&10
Chair nails.....dis 66&10
Common and patent brads.....dis 66&10

Keep a Record of Your Insurance

By ordering one of our Improved

Expiration Registers.

Blanks for all the essential points of each policy.

ONLY 50 CENTS (Postage paid).

Will last for years. Sample leaves sent on application. Address

The Cleveland Printing & Publishing Co.

27, 29 and 31 Vincent Street,

CLEVELAND, O.

FREIGHT AND PASSENGER

ELEVATORS.

L. S. GRAVES & SON,

Main Office and Works, ROCHESTER, N. Y.

BRANCH OFFICES:

NEW YORK, 92 and 94 Liberty St.; BOSTON, 113 Devonshire St.; St. LOUIS, 301 Roe Buildin DETROIT, Hodges Building.

SEND FOR CATALOGUE.

RUBBER GOODS

PACKING, BELTING, HOSE, GASKETS, ETC.

Fuller Bros.,

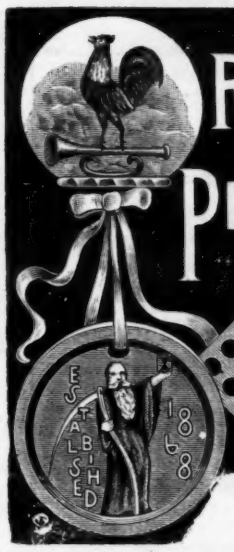
AGENTS

JEWELL LEATHER BELT, and REVERE RUBBER CO.

148 SUPERIOR STREET, CLEVELAND.

THE ROBERT AITCHISON PERFORATED METAL CO.

CHICAGO, ILL.



PERFORATED METALS OF ALL KINDS

OFFICE 510---265 to 269 DEARBORN ST.

WORKS AT SOUTH CHICAGO.

DIXON'S GRAPHITE PAINT

THOSE who use it say that one pound will cover 2 to 3 times more surface and last 4 to 5 times longer than any lead, mineral or metallic paint. A tin or iron roof well painted will not require repainting for 10 to 15 years.

JOS. DIXON CRUCIBLE CO.,

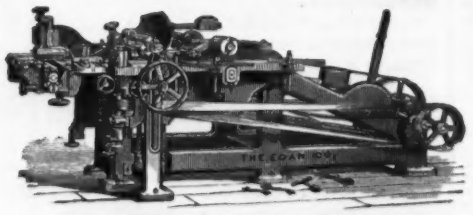
Jersey City, N. J.

THE EGAN CO.,

Nos. 251 to 271 W. Front St., CINCINNATI, OHIO.

Builders and Originators, Designers and Constructors.

Wood-Working Machinery.



New "Standard Molder, Four Sided.

4, 6, 7, 8, 9, 10 and 12-inch.
Geared feed rolls, two above and two in table. Slotted steel heads.

For Every Purpose
Meeting the requirements of
PLANING MILLS,
SASH, DOOR and BLIND FACTORIES,
PATTERN SHOPS,
General Wood-workers etc.

With the latest and most advanced type of machines for fast and perfect work.

Send for Catalogue and information.

AKRON CHEMICAL CO.,

Imperial Car and Bridge Paints.

PAINTS.

Black Asphaltum Paints. All grades.

150 State Street, AKRON, O.

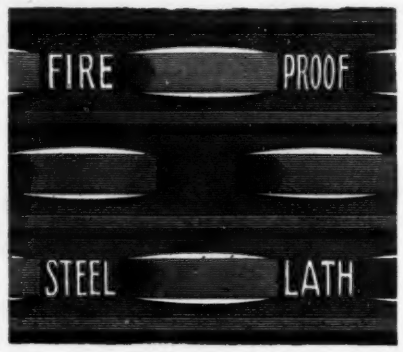
Classified List of Advertisers.

The star (*) indicates that the adv. appears alternate weeks; the dagger (†) once a month; the double dagger (‡) once in three weeks.

PAGE

Automatic Sprinklers—
*Neracher Sprinkler Co., Warren, O..... —
Advertising Agencies—
G. P. Rowell, New York..... 10
Belting—
Fuller Bros., Cleveland..... 15
Bolts and Bolt Machinery—
Upson Nut Co., Cleveland..... 16
Boilers and Boiler Attachments—
Babcock & Wilcox Co., New York..... 20
Wm. B. Pollock & Co., Youngstown, O..... 18
E. H. Jones & Co., Cleveland..... 18
Hazelton Tripod Boiler Co., Chicago..... 18
Enterprise Boiler Co., Youngstown, O..... 20
The Stirling Co., Barberton, O..... 10
*Chandler & Taylor Co..... —
Skinner Engine Co..... 19
Geo. Place, New York, N. Y..... 10
Southwark Foundry & Machine Co..... 19
*Leffel Water Wheel and Engine Co..... —
*James Leffel & Co., Springfield, O..... —
Blowers—
LaFountaine Mfg. Co., Cleveland, O..... 18
E. H. Jones & Co., Cleveland..... 18
Boiler Solvents—
The Dearborn Drug & Chemical Co..... 8
Blowing Engines—
The James Leffel Co..... 13
Southwark Foundry & Machine Co..... 19
Coal and Coke—
Pittsburgh & Wheeling Coal Co., Cleveland..... 13
Cranes and Derricks—
Wm. Tod & Co., Youngstown O..... 18
Southwark Foundry & Machine Co..... 19
Chain Belting—
Jeffrey Mfg. Co., Columbus O..... 14
Carpet Cleaning & Laundry Machines —
LaFountaine Mfg. Co., Cleveland, O..... 18
Civil Engineers and Architects—
F. Felkel, Cleveland, O..... 16
Cupolas—
Victor Colliau, Detroit, Mich..... 12
Corrugated Steel—
*Cincinnati Corrugating Co., Piqua, O..... 12
Drilling Machines—
Universal Radial Drill Co., Cincinnati, O.. 20
Drop Presses—
Toledo Tool & Machine Co., Toledo, O..... 18
Desks—
Cleveland Desk Co., Cleveland..... 13
Elevators—
L. S. Graves & Co., Rochester, N. Y..... 15
Explosives—
Hercules Powder Co., Cleveland..... 18
Electrical Manufactures—
†Cleveland Electrical Mfg. Co., Cleveland —
Central Thomson-Houston Co..... 9
Edison General Electrical Co., N. Y..... 12
Emery Wheel Machinery—
J. Wendell Cole, M. E., Columbus, O., or Chicago, Ill..... 20
Engravers and Electrotypers—
Eclipse Electrotype & Engraving Co., Cleveland..... 17
Union Electrotype Foundry, Cleveland.... 14
Engines (Steam)
*Chandler & Taylor Co., Indianapolis, Ind. —
Wm Tod & Co., Youngstown, O..... 18
E. H. Jones & Co., Cleveland..... 18
Buckeye Engine Co., Salem, O..... 20
Skinner Engine Co., Erie, Pa..... 19
Westinghouse Machine Co., Pittsburgh.... 19
Ball & Wood Co., Elizabeth, N. J..... 19
Southwark Foundry & Machine Co., Philadelphia, Pa..... 19
*The Leffel Water Wheel & Engine Co..... —
Geo. Place, New York..... 10
Totten & Hogg, Pittsburgh, Pa..... 10
Webster, Camp, & Lane Machine Co..... 14
*James Leffel & Co., Springfield, O..... —
Engines (Gas)—
Schleicher, Schumm & Co., Philadelphia, Pa. and Chicago, Ill..... 18
Van Dusen Gas Engine Co., Cincinnati, O..... 17
Engineers and Contractors—
E. H. Jones & Co., Cleveland..... 18
F. Felkel, Cleveland..... 16
Ejectors—
James Jenks, Detroit, Mich..... 12
Engineers' Specialties—
†Butman Furnace Co..... 10
Spaulding & Metcalf..... 10
Files, Makers of—
Reynolds Bros., Columbus, O..... 20
A. & H. Gough, Cleveland..... 20
Parkin & Bosworth Co., Cleveland..... 20
Forges—
Cleveland City Forge & Iron Co., Cleveland 20
Foundries—
Thos. D. West Foundry Co., Cleveland..... 14
Canton Iron Foundry Co., Canton, O..... 14
Spicer Mfg. Co, New Philadelphia, O..... 10
For Sale, Wants, etc.—
The James Leffel Co..... 13
B. M. Gardner, Cleveland..... 16
Flue Cleaners—
†Butman Furnace Co..... 10
Galvanizers.
*H. H. Hodell, Cleveland..... —
Gear Cutters—
Palmer, Cunningham & Co., Philadelphia, Pa..... 14
Grapples, Excavators and Dredges—
Jas. H. Lancaster, New York..... 17
Graphite Paint—
Jos. Dixon Crucible Co., Jersey City..... 15
Granulated Raw Bone—
The Rogers & Hubbard Co., Middletown. 12
Heating Apparatus—
LaFountaine Mfg. Co., Cleveland, O..... 18
Heaters and Purifiers—
Stilwell & Bierce Manufacturing Co., Dayton, O..... 20
W. H. Jones & Co., Cleveland..... 18
*Warren Webster & Co., Philadelphia, Pa —
Hangers—
LaFountaine Mfg. Co., Cleveland, O..... 18
Geo. Place, New York, N. Y..... 10
Hammers (Pow r)—
Hackney Hammer Co., Cleveland..... 9
Harness Specialties—
Buffalo Specialty Co., Buffalo, N. Y..... 17
Insurance Companies—
Hartford Steam Boiler Co..... 16
Investments—
W. N. G., Cleveland..... 13
*Muskegon Improvement Co..... 11
Iron and Steel Roofing—
Sykes Iron & Steel Roofing Co., Niles, O... 19
Cambridge Iron Roofing Co., Cambridge, Ohio..... 19
Garry Iron Roofing Co., Cleveland..... 19
*Berger Mfg. Co., Canton, O..... 19
Eberts Bros., Detroit, Mich..... 20
Kanneberg Roofing Co., Canton, O..... 19
*The Long Steel and Iron Roofing and Corrugating Co., Indianapolis..... 19
J. H. Eller & Co., Canton, O..... 19
W. J. Burton & Co., Detroit, Mich..... 14
Holton Iron Roofing Co, New Lisbon, O... 19
Iron Ore, Bar and Pig Iron—
Dalliba, Corrigan & Co., Cleveland..... 13
Oglebay, Norton & Co., Cleveland..... 13
J. H. Outhwaite & Co., Cleveland..... 13
Condit-Fuller Co., Cleveland, O..... 13
E. C. Pope, Cleveland..... 13
Cleveland Iron Mining Co., Cleveland..... 13
Injectors—
Penberthy Injector Co., Detroit, Mich..... 20
*Garfield Injector Co., Wadsworth, O..... 12
Lathes—
H. L Shepard, Cincinnati, O..... 16
Parkin & Bosworth Co., Cleveland..... 20
Lathe Dogs—
Palmer, Cunningham & Co., Philadelphia 14
Mining Machinery—
Webster, Camp & Lane Machine Co., Akron, O..... 14
*Copeland & Bacon, New York..... 12
Jas. H. Lancaster, New York..... 17
Machine Shops—
Webster, Camp, & Lane Machine Co., Akron, O..... 16
Toledo Machine & Tool Co., Toledo, O..... 18
Spicer Mfg. Co., New Philadelphia, O..... 10
Machinists' Tools and Supplies—
Parkin & Bosworth, Co., Cleveland.....16 & 20
Garvin Machine Co., New York..... 12
Metal Ceilings—
Fred F. Bischoff, Chicago, Ill..... 16
Merchandise Brokers—
L. H. Oldfield, Wichita, Kan..... 16
Metallic Shingles—
W. J. Burton & Co..... 14
Metallic Roofing—
*Stan Alumin Co., Canton, O..... —
Manufacturing Sites—
*Muskegon Improvement Co..... 11
Luis Jackson, Chicago, Ill..... 10
Patents—
*Munn & Co., New York..... 12
W. T. Fitzgearld, Washington, D. C..... 10
Pumps (Steam)—
E. H. Jones & Co., Cleveland..... 18
Deming Co., Salem, O..... 18
Southwark Foundry & Machine Co..... 19
Paint—
Iron Clad Paint Co., Cleveland, O..... 12
Akron Chemical Co., Akron O..... 15
Jos. Dixon Crucible Co., Jersey City..... 15
Perforated Sheet Metal—
Harrington & King Perforating Co., Chicago, Ill..... 12
Aitchison Perforated Metal Co., Chicago. 15
Pipe Cutting & Threading Machines—
*Wells Machine Works, Fostoria, O..... —
Power Hammer—
Hackney Hammer Co..... 9
Powder Mining Machinery—
Hercules Powder Co..... 18
Railroads—
Time Tables, Etc..... 17
Railway Supplies—
Cleveland City Forge & Iron Co., Cleveland..... 20
Rock Breakers and Ore Crushers—
Jas. H. Lancaster, New York..... 17
Totten & Hogg, Pittsburgh, Pa..... 10
Rubber Goods—
Fuller Bros., Cleveland..... 15
Rolls and Pinions—
Totten & Hogg Iron & Steel Foundry Co., Pittsburgh, Pa..... 10
Saws—
Peter Gerlach & Co., Cleveland..... 13
Shafting—
*Brightman Machine Co., Cleveland..... 12
Geo. Place, New York, N. Y..... 10
Steam Boiler Inspectors—
Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn..... 16
Steel Stamps and Stencils—
J. H. Fleharty & Co., Cleveland..... 16
F. A. Sackman, Cleveland, O..... 14
Jas. Murdock Jr., Cincinnati, O..... 16
Sheet Iron—
Cleveland Rolling Mill Co., Cleveland....13, 16
Cambridge Iron & Steel Co., Cambridge, O 13
Steam & Hot Water Heating—
N. Y. Central Iron Works, Geneva, N. Y.. 12
Steel Rails, Blooms and Billets—
Cleveland Rolling Mill Co., Cleveland....13, 16
Sheet Steel—
Cambridge Iron & Steel Co., Cambridge, O 13
Steel Laths—
Bostwick Steel Lath Co., Niles, O..... 16
Steel Castings—
Chester Steel Casting Co., Philadelphia, Pa..... 19
Steam Traps—
Spaulding & Metcalf..... 10
Twist Drills—
Cleveland Twist Drill Co., Cleveland..... 20
Graham Twist Drill Co., Detroit, Mich..... 20
Turnbuckles—
Cleveland City Forge & Iron Co., Cleveland..... 20
Time Registers—
The Automatic Time Stamp and Register Co, Boston, Mass..... 14
Ventilating Fans—
LaFountaine Mfg. Co., Cleveland, O..... 18
E. H. Jones & Co., Cleveland..... 18
Water Gas Furnaces—
W. S. Hutchinson, Chicago, Ill..... 20
Window Blinds—
Hartman Sliding Blind Co., Wooster, O... 16
Wood-Working Machinery—
*Indiana Machine Work, Ft. Wayne, Ind —
Geo. Place, New York, N. Y..... 10
Frank & Co., Buffalo, N. Y..... 18
The Egan Co., Cincinnati, O..... 15
Wire Goods—
*F. Powell & Co., Toledo, O..... —
Wire Machinery—
John Adt & Son, New Haven, Conn..... 20
Well Sinking Machinery—
American Well Works, Aurora, Ill..... 16
Washers—
Milton Mfg. Co., Milton, Pa..... 10

BOSTWICK PATENT.



A great saving in mortar, material and labor Write for Catalogue and Sample.
THE BOSTWICK STEEL LATH CO.,
38 Park Row, New York City. Niles, O
Mention this Paper.

J. M. ALLEN, President.
WM. B. FRANKLIN, Vice-President.
F. B. ALLEN, Second Vice-President.
J. B. PIERCE, Secretary and Treasurer.

HARTFORD STEAM BOILER INSPECTION AND INSURANCE CO. HARTFORD, CONN.

A. S. FERRY, Gen'l Agt., 208 Superior Street, Cleveland, O.
C. A. BURWELL, Chief Inspector, 208 Superior St., Cleveland, O.
R. D. BRIGGS, Special Agt., 208 Superior St., Cleveland, O.
J. E. WOLCOTT Special Agent, 208 Superior St., Cleveland, O.
L. C. BURWELL, Special Agent, 81 4th Ave Pittsburgh, Pa.

L. H. OLDFIELD.
Merchandise Broker.
Correspondence Solicited.
WICHITA, KANSAS.

FOR SALE.
Manufacturing Site
ON CANAL ST., CLEVELAND,
Adjoining White Sewing Machine Co.'s Plant. About 67 ft front extending back to Valley R. R. tracks. For particulars address
B. M. GARDNER,
CARE IRON TRADE REVIEW.

CLEVELAND BUSINESS DIRECTORY.

F. FELKEL,
CIVIL ENGINEER AND ARCHITECT,
155 ST. CLAIR ST., CLEVELAND, O.
IRON BUILDINGS, LARGE SPAN ROOFS
PLANS for Manufacturing Plants, Warehouses andother Heavy Structures a SPECIALTY.

Bolt and Nut Works.
THE UPSON NUT CO, Manufacturers of Nuts, Washers, Carriage, Machine, Plow and Elevator Bolts, Coach Screws, etc.

Hardware and Iron.
CLEVELAND ROLLING MILL CO., manufacturers of Steel and Iron Wire and Steel Tire.

Machinists' Supplies.
PARKIN & BOSWORTH, 9 and 11 So. Water St., dealers in Manufacturers' Supplies, Machinery and Tools.

Steel Stamps and Stencils.
FLEHARTY, J. H. & CO., Rubber Stamps, Seals, Stencils, Automatic Check Punches and Numbering Machines. 92 Seneca St.

BOSINESS DIRECTORY.

Akron, O.
WEBSTER, CAMP & LANE MACHINE CO., Founders and Machinists, 12 Main st.

CHEMIST—A chemist wants position in iron or steel works, or at ore mines. Address L. P. N., Iron Trade Review.

$HEPARD'S NEW $60
SCREW CUTTING
Foot Lathe

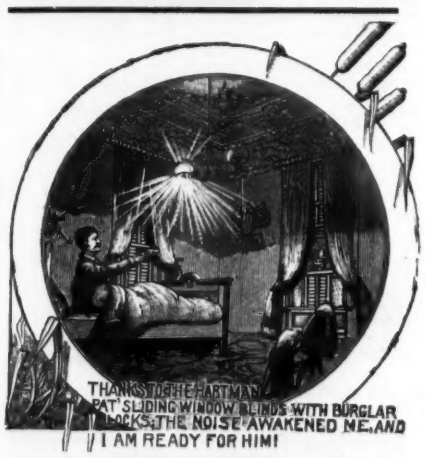
Foot & Power Lathes-Drill Presses, Scroll-Saw Attachm'ts, Mandrels, Chucks, Twist Drills, Dogs, Caliperr, etc. Lathes on trial Lathes on payment. Send for catalogue of Outfits for Amateurs or Artisans. Address H L. SHEPARD, Agt., 124 East Second St., Cincinnati, O.

Bischoff Metal Ceilings,
(PATENTED.)

It will pay to investigate and write for catalogue.
Estimates submitted on application.
Fred. F. Bischoff & Co.
24 W. Lake St,
CHICAGO. - ILL.

JAS. MURDOCK, JR.
Manufacturer of
STEEL STAMPS
NAME PLATES,
& TIME & TOOL ROOM
CHECKS.
NILES TOOL WORKS 25
52 Longworth St, Cincinnati, O

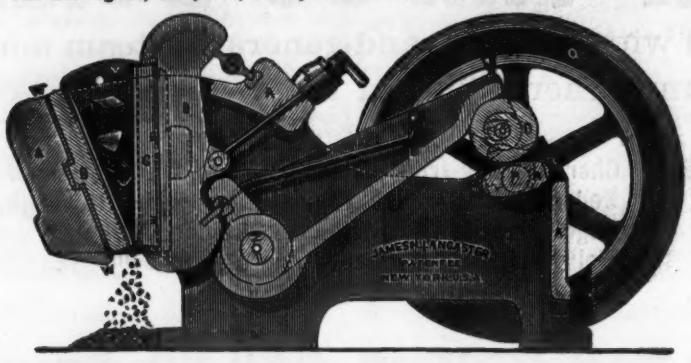
LIGHTNING WELL-SINKING
MACHINERY MANUFACTURERS.
Hyrdaulic, Jetting, Revolving, Artesian, Diamond Prospecting Tools, Engines, Boilers, Wind Mills, Pumps. **Encyclopedia**, 1,000 engravings, Earth's Strata, Determination quality water; mailed, 25c.
The American Well Works.
Aurora, Ill.
Branches: 11 & 13 S. Canal St., Chicago, Ill.
Dallas, Texas.



Tens of thousands of these blinds are in use. Agents wanted; Send 4-cent stamp for an 80-page illustrated catalogue to
HARTMAN SLIDING BLIND CO.,
59 Beaver St., WOOSTER O., U. S. A

The "Lancaster" Rock Breaker and Ore Crusher

The Strongest, Simplest, Cheapest and the Most Perfect Crusher Made.



Instantly adjustable to yield any desired uniform grades of product.

Half the power only required and is less liable to breakage, and less in first cost and also in subsequent wear and tear, and less weight than any rival's breaker. For crushing rock for macadamizing and concreting purposes, and also for reducing ores, these breakers are specially efficient.

The "Lancaster" Crushers are also made in "Sections" for easy transportation in mountainous regions. May be mounted on wheels, worked by hand, horse gear and steam or other power, and also fitted with Rotary Screens, Elevators and Conveyors. Correspondence and trial tests solicited.

THE "LANCASTER"

Will automatically dig, raise and discharge mud, clay, gravel, sand, hard pan ores, rock phosphates and fire-clay from their beds and banks, and also load and unload vessels or barges with sand, coal, ores, grain and other materials. These Grapples are made of best forged steel, with four penetrating scoops, operated solely by compound leverage, thus dispensing with the inside sheaves, drums, catches, gears, chains and friction, found in all rival buckets. They may be worked by the "Lancaster" hand or horse-power, hoisters, or by any maker's double drum hoisting engines.

Send for our new illustrated price list, agency terms and testimonials, and make appointment to see our Rock Breakers, Grapples, Hand, Horse and Steam Power Hoisters at work. Comparison of our prices, capacities and merits with all rival Grapples, Rock Breakers, Hoisters, etc., earnestly solicited.

Self-Penetrating Grapple, Excavator and Dredger.

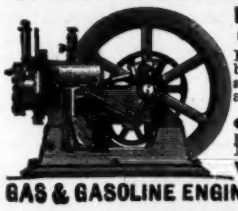
Correspondence solicited. Manufactured and sold by the patentee.

THE LANCASTER DIRECT STEEL PROCESS.

JAMES H. LANCASTER. (P. O. BOX 3139) 202 BROADWAY. NEW YORK, U. S. A.

GAS and GASOLINE ENGINES

STATIONARY and PORTABLE. All Sizes.



Dwarfs in Size, but Giants in Strength.

Expense one cent an hour per horse power and requires but little attention to run them. **Every Engine Guaranteed.** Full particulars free by mail Mention this paper.

VAN DUZEN GAS & GASOLINE ENGINE CO. Cincinnati, O.

Just Drive 'Em In and CLINCH 'Em.

THAT IS ALL YOU HAVE TO DO WITH

RAPID

HARNESS MENDERS.

THEY WILL MEND ANY STRAP

OR

HARNESS.

BETTER THAN IF SEWED, TWICE AS QUICK, AND COSTS LESS THAN HALF A CENT.

THIS CUT SHOWS THE WAY IT IS DONE.

They are put up in nice tin boxes containing three sizes one gross in each package. If you break down anywhere you can easily and quickly repair your HARNESS yourself.

COST ONLY 25c PER BOX. FOR SALE BY GROCERS AND HARDWARE DEALERS OR SEND TO THE MANUFACTURERS.

NO TOOLS REQUIRED.

Buffalo Specialty Mfg. Co.,
BUFFALO, N. Y.

Wheeling & Lake Erie Railway.

THE NEW THROUGH LINE

BETWEEN

TOLEDO

—AND—

Steubenville, Pittsburgh, Marietta.

THROUGH COACHES

BETWEEN

Toledo & Marietta.

Through Sleepers Between

PITTSBURGH AND CHICAGO.

AND DAY COACHES BETWEEN

Toledo and Pittsburgh, Via Akron, Cuyahoga Falls, Kent, Ravenna, Leavittsburg, Warren, Niles, Girard, Youngstown, New Castle and Allegheny.

The Only Line running through

"BEAUTIFUL ZOAR."

A. G. BLAIR, Traffic Manager. JAS. M. HALL, Gen'l Pass. Agent.

TRAVELERS' REGISTER.

Standard Time.

Erie Railway.

Depot, South Water Street and Viaduct.

	Arrive.	Depart.
N. Y. & Pitts. Express.....	†5 38 a m	*8 25 a m
Fast N. Y. & Pitts. Express*	10 55 a m	*3 00 p m
Mahoning Accommo.....		†6 40 a m
Pittsburgh Express.....	†6 35 p m	
Youngstown Local.....	†8 05 a m	
Mahon'g div. & Pitts Local		*11 40 a m
Mahoning Val. Accom.....		†4 30 p m
Pittsburgh Express.....	†1 20 p m	11 10 p m
New York Express.....	*8 00 p m	.....

*Daily. †Daily, except Sunday. ‡Daily except Monday.

Cleveland & Canton Railroad.

(Standard Gauge.)

Depart for—

Zanesville and Coshocton—6:50 a. m., 3:00 p. m.
Canton—6:50 a. m., 3:00 p. m., 6:20 p. m.
Kent—6:50 a. m., 3:00 p. m., *5:45 p. m. 6:20 p. m.
Bedford—6:50 a. m., 11:10 a. m., 1:30 p. m., 3:00 p. m., 4:40 p. m., *5:45 p. m., 6:20 p. m. 10:35 p. m.
Newburgh—6:15 a. m., 6:50 a. m., 11:10 a. m., 1.30 p. m., 3:00 p. m., 4:40 p. m., *5:45 p. m., 6:20 p. m., 10:35 p. m.

Arrive from—

Zanesville and Coshocton—10:30 a. m.,6:30 p m.
Canton, 10:30 a. m., 2:35 p. m., 6:30 p. m.
Kent—*8:10 a. m., 10:30 a. m., 2:35 p. m., 6:30 p.m.
Bedford—6:00 a. m., *8:10 a.m., 10:30 a.m., 1:05 p. m., 2:35 p. m., 4:15 p. m., 6:30 p.m., 7:10 p.m.
Newburgh—6:00 a. m., 7:15 a. m., *8:10 a. m., 10:30 a. m., 1.05 p. m., 2:35 p. m., 4:15 p. m., 6:30 p. m., 7:10 p. m.

Trains marked * run daily.

Valley Railway.

FOR AKRON, CANTON AND MARIETTA.

Depot oot South Water Street.

	Depart.	Arrive.
Valley Junction Mail.....	*7 25 a m	*6 40 p m
Chicago Express	*8 35 a m	*10 00 p m
Marietta Express.....	†11 15 a m	†2 35 p m
Balto. & Wash. Express....	*4 00 p m	*10 25 a m
Cleve. and Canton Express	†6 30 p m	†8 20 a m

*Daily. †Daily, except Sunday.

J. T. JOHNSON, Gen. Supt. J. B. CAVEN, Gen. Pass. Agt.

From Cleveland Union Station.

PENNSYLVANIA LINES.

Cleveland & Pittsburgh R. R.

	Arrive.	Depart.
For Pittsburgh, Baltimore, Washington, Philadelphia and New York.	d5 25 a m d11 40 a m 6 35 p m	7 45 a m d1 40 p m d11 10 p m
Wellsville, Wheeling and Bellaire.	12 30 p m 6 35 p m	7 45 a m 1 05 p m *11 10 p m
Alliance Accom.....	10 10 a m	3 25 p m
Ravenna Accom.....	8 25 a m	5 00 p m

d Daily. * Except Saturday. Other trains except Sunday. Through Pullman Sleepers to New York on 1:40 p. m. train daily.

From Cleveland Union Station.

Mt Vernon and Pan Handle Route

Cleveland & Pittsburgh R. R.

	Arrive.	Depart.
For Cuyahoga Falls, Akron, Orrville, Millersburg, Gambier, Mt. Vernon, Columbus, Xenia, Dayton, Cincinnati, Louisville, Indianapolis, St. Louis, and all points in the South and Southwest	d 7 00 am 5 40 p m	8 00 a m d 8 00 p m
For Cuyahoga Falls, Akron, Orrville, Millersburg, Gambier, Mt. Vernon and Columbus.	12 30 p m	1 05 p m
For Cuyahoga Falls, Akron, Orrville, Chicago, and all points in the West and Northwest.	5 40 p m 10 10 a m	8 00 a m 3 25 p m

d Daily. Other trains except Sunday.

Pullman Palace Sleeping Cars daily between Cleveland, Columbus and Cincinnati. City ticket office, Weddell House corner.

FT. WAYNE, CINCINNATI & LOUISVILLE RAILROAD.

The Popular Route Between the

NORTH and SOUTH

The Direct Route to or from

Fort Wayne, Indianapolis, Terre Haute, Evansville and St. Louis.

13 MILES SHORTER BETWEEN 13

Fort Wayne and Indianapolis,

Than any other Route.

22 MILES SHORTER AND QUICKER 22

BY THREE HOURS, BETWEEN

Louisville and Fort Wayne.

ASK FOR TICKETS VIA

Ft. Wayne, Cincinnati & Louisville R. R.

For sale by all Agents of connecting lines, East, West, North and South.

GEO. W. SAUL, Gen'l Supt. W. H. FISHER, Gen'l Pass. & Tk. Agt.

FORT WAYNE, IND.

PITTSBURGH AND LAKE ERIE RAILROAD.

"Cleveland & Pittsburgh Short Line."

Twenty (20) Miles Shorter than any other route between Cleveland, Pittsburgh, Washington, Baltimore and the South East.

5 Through Trains Daily 5

FAST TIME. NO DELAYS.

"For scenery picturesque and varied,
Through valleys green, 'mong mountains ser-
The people's favorite route I ween, (ried,
The P. & L. E. sits enthroned as queen."

See that your tickets read via

THE PEOPLE'S FAVORITE ROUTE.

R. HOLBROOK, Gen'l Supt., A. H. CLARK, G. P. & T. A.

Pittsburgh, Pa.

SCIOTO VALLEY RAILWAY.

Direct route, Columbus, O., to Circleville, Chillicothe, Waverly, Portsmouth, Ironton and Ashland, Ky. Three trains daily except Sunday. Favorite route, North and West, making close connection at Ashland, Ky., with the Chesapeake & Ohio Ry., through the canons of New River, passing White Sulphur Springs and the many Summer resorts of the Alleghenies in Virginia.

Shortest and Quickest Route to Richmond, Lynchburg, Newport News, Old Point Comfort.

J. ROBINSON, Receiver, Columbus, O. JNO. J. ARCHER, Gen'l Pass. Agt

—THE—

Cleveland & Marietta Ry.

THROUGH TRAINS

BETWEEN

Toledo, Cleveland and the Ohio River.

The shortest and best Route via Marietta to

Washington, D. C., Charleston, W. Va., Parkersburg, W. Va., and the South.

Direct connections at Union Depots, with all great through lines to all Points

WEST, NORTHWEST, SOUTH, SOUTHWEST AND SOUTHEAST.

Lowest Rates. Quickest Time.

Best Accommodations.

Tickets sold and baggage checked through to destination. Reliable information and best rates will be furnished by any agent of the Popular C. M.

A. T. WIKOFF, Pres. and Gen. Mgr. W. K. RICHARDS, G. P. & T. A.

THE FAVORITE

—AND—

PICTURESQUE ROUTE

—TO—

New York, Boston and the East.

The shortest and quickest Route to Pittsburgh, Washington and Baltimore & the South-east.

New Central Depot So. Water St. and Viaduct

	Depart.
No. 62, Accommodation.....	† 6 00 a m
No. 72, New York & Pitts. Express....	* 8 10 a m
No. 70, Pittsburgh Accom.....	*11 25 a m
No. 64, New York & Pitts. Limited...	* 2 50 p m
No. 66, Mantua Accommo.....	* 4 20 p m
No. 74, Youngst'n Ex.....	† 6 00 p m
No. 68, New York & Pitts. Ex.....	*11 00 p m
	Arrive.
No. 61, N. Y. & Pittsburgh Express...	† 5 15 a m
No. 71, Youngstown Accom.....	* 7 15 a m
No. 65, New York & Pitts. Lim.....	* 9 55 a m
No. 67, Pittsburgh Accom.....	*12 30 p m
No. 73, Leavittsburgh Local.....	* 2 10 p m
No. 63, New York & Pitts. Ex.....	* 6 50 p m
No, 75, Mantua Accom.....	* 7 20 p m
No. 69, Youngstown Express.....	† 9 10 p m

*Daily. †Daily, except Sunday.

Baggage checked through to all points East.

Through tickets and information regarding the route can be obtained at office, 141 Superior street, and at Depot N. Y., P. & O. Railroad, South Water street and Viaduct, Cleveland.

A. M. TUCKER, Gen. Mang., Cleveland, O.
W. C RINEARSON, Gen. Pass. Ag't, New York.
G. E. FOUTS, C P. & T. A., Cleveland.

ECLIPSE ELECTROTYPE ENGRAVING CO.

AUST & CLARK PROPRIETORS

THE HAZELTON TRIPOD BOILER

Furnishes more and dryer steam with less fuel, and generates steam more rapidly, than any other boiler in use.

CLEVELAND REFERENCES.

J. W. Britton, Esq..
Woods, Jenks & Co.,
W. S. Tyler Wire Works Co.,
Cleveland Forge & Iron Co.,
Bishop & Babcock Co.,
Cleveland Saw Mill & Lumber Co.

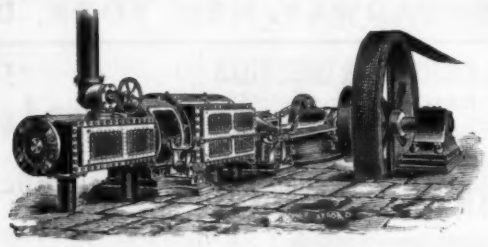
Cherry Valley Iron Works, Leetonia, O.,
Federal St. & Pleasant Valley Pass. Ry., Pittsburgh, Pa.,
Anglo-American Provision Co., Chicago,
Wellsville Plate & Sheet Iron Co., Wellsville, O.,
Falcon Iron & Nail Co., Niles, O.

Address: THE HAZELTON TRIPOD BOILER CO.,

GEO. A. HUMPHREYS, Ag't, 723 Perry-Payne Bldg., CLEVELAND, O. 809 Monon Block, 324 Dearborn St., CHICAGO, ILL.

Who also offer the Hazelton Purifier which we guarantee will remove 90 to 95 per cent. of the impurities from feed-water.

WILLIAM TOD & CO., YOUNGSTOWN, OHIO.



The Porter Hamilton Engine.

Single Compound and Condensing-100 horse-power and upwards.

THE HAMILTON BLOWING EFGINE, HYDRAULIC CRANES, ACCCUMULATORS AND SHEARS.

HEAVY SPECIAL MACHINERY GENERALLY.

☞ SEND FOR ILLUSTRATED CATALOGUE.

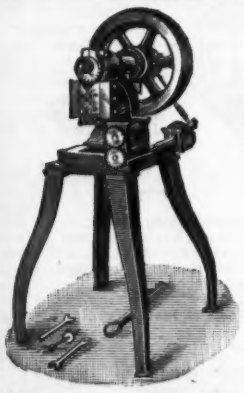
E. H. JONES & CO.,

ENGINEERS AND CONTRACTORS,

223-225 River St., CLEVELAND, O.

Steam Plants Complete. Engines, Boilers, Pumps, Heaters, Etc.
Steam and Hot Water Heating.

STURTEVANT'S BLOWERS, COILS, ETC., FOR HOT BLAST HEATING.



THE TOLEDO MACHINE TOOL CO.,

MANUFACTURERS OF

PRESSES, DROP PRESSES, DIES,

AND

Special Machinery

DESIGNED AND BUILT TO ORDER.

Dies for all kinds of sheet metal goods, leather, paper, etc. Inventors' models and specialties. Send for circulars and prices.

St. Clair and Washington Streets.

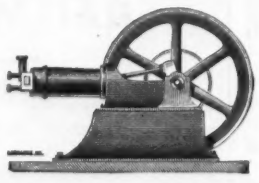
Mention this paper. TOLEDO, O

Otto Gas Engine Works,

SCHLEICHER, SCHUMM & CO., { Philadelphia. / Chicago.

Horizontal OTTO Gas Engines.
Vertical OTTO Gas Engines.
Twin Cylinder OTTO Gas Engines.
Combined OTTO Gas Engine Pumps.
Combined OTTO Gas Engine Dynamos.

SIZES: 1, 2, 4, 7, 10, 15, 25 AND 50 HORSE-POWER.



LaFountaine Manufacturing Co.,

MANUFACTURER OF

VENTILATING FANS AND BLOWERS, HANGERS,

Carpet Cleaning and Laundry Machinery and other Special Machinery.

1335 Lexington Ave.. • CLEVELAND, O.

THE DEMING CO.,

SALEM, OHIO.

Pumps,

For HAND AND POWER.

Adapted for BOILER FEEDING, FIRE PURPOSES, etc.; also ARTESIAN WELL CYLINDERS and WORKING HEADS for FACTORIES, MILLS and FURNACES.

HENION & HUBBELL, 55 & 57 N. Clinton St., Chicago, General Western Agents

Send for illustrated catalogue and price list. Mention this paper.

BOILERS

MAHONING BOILER WORKS.

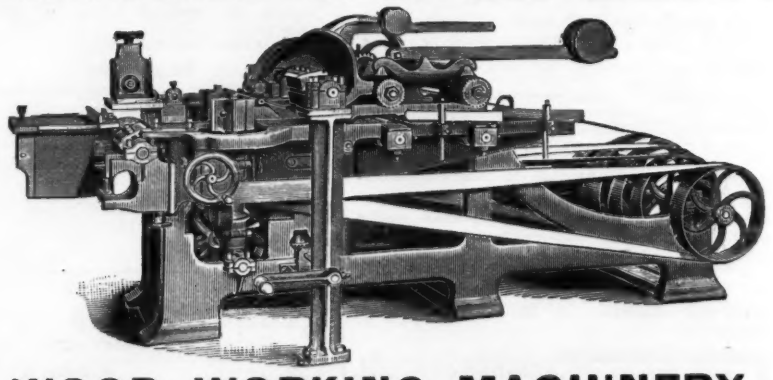
PIPES, STACKS, BEAMS, ROOF TRUSSES, BLAST FURNACES & ROLLING MILL WORK.

WM. B. POLLOCK & CO. YOUNGSTOWN, O.

FRANK & CO., BUFFALO, N. Y.

MANUFACTURERS OF

PLANERS, BAND SAWS, MOULDERS, SCROLL SAWS, TENONERS, SAW TABLES, MORTISERS BENCHES.



WOOD WORKING MACHINERY.

HERCULES POWDER

HERCULES,
THE GREAT STUMP AND ROCK
ANNIHILATOR.

SEND FOR DESCRIPTIVE PAMPHLET.

Stump before a blast. | Fragments after a blast.

STRONGEST and SAFEST EXPLOSIVE Known to the Arts.

POWDER, FUSE, CAPS, Electric Mining Goods,

AND ALL TOOLS FOR STUMP BLASTING,
FOR SALE BY THE
HERCULES POWDER COMPANY,
40 Prospect Street, Cleveland, Ohio.
J. W. WILLARD, Manager.

THE BALL & WOOD CO.,

Owners of Ball Patents and Builders of

Improved Automatic Cut-off Engines.

Under the personal supervision of the inventor, F. H. Ball.

Simple Engines, **Electric Lighting Plants,**
Compound Engines, for **Electric Railway Plants,**
Triple Expansion Engines, **Manufacturing Engines,**

And all purposes requiring close regulation and economy.

WORKS, ELIZABETH, N. J. **OFFICE, 15 CORTLANDT ST., N. Y.**

The Long Steel & Iron Roofing & Corrugating Co.,

(Successors to O. S. KEELY & CO.) Manufacturers of

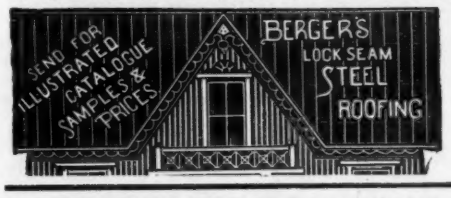
STEEL AND IRON ROOFING,

Corrugated Siding and Ceiling, Iron Ore Paint, Cement, Etc.

N. E. Cor. Illinois and Merrill Streets, INDIANAPOLIS, IND

Write for Catalogue and Price List.

The BERGER MANUFACTURING COMPANY, CANTON, O.



DON'T make arrangements for ROOFING until you have seen ours.

It Excels all other Metal Roofs.

WESTINGHOUSE ENGINES

A FEW PROMINENT MISCELLANEOUS USERS

(Excepting Governments and Railroads).

Adams Express Company; Allegheny City Light Plant; Allegheny County Light Company; Anheuser-Busch Brewing Company; Arbuckle Brothers; Ashcroft Manufacturing Company; E. Balbach & Son; Baldwin Locomotive Works; Bowers Dredging Company; Brooks Locomotive Works; Brown & Sharpe Manufacturing Company; Brush Electric Company of Baltimore; Brush Electric Light Company of Buffalo; Burlington Electric Street Railway Company; Calumet & Hecla Mining Company; Cambria Iron Company; Carnegie, Phipps & Company; Cincinnati Gas Light & Coke Company; Coxe Brothers & Company; Crescent Steel Works of Miller, Metcalf & Parkin; Cumberland & Presumpscot Mills, Denver Consolidated Electric Company; Detroit Dry Dock Company, Detroit Electric Light & Power Company; Dunnell Manufacturing Company; East End Electric Light Company of Pittsburgh; Elgin National Watch Company; Federal Street & Pleasant Valley Electric Street Railway Company of Pittsburgh and Allegheny; Forest Paper Company; Gate City Oil Mills; Glen Echo Electric Street Railway Company of Washington; Herkimer Paper Company; Howe, Brown & Company; Illinois Steel Company; Lehigh Avenue Passenger Electric Street Railway Company of Philadelphia; Lombard, Ayres & Company; McConway & Torley Company; McKeesport Electric Light Company; Metropolitan Electric Light Company of London; Missouri Electric Light & Power Company of St. Louis; Muncie Pulp & Paper Company; New England Dredging Company; Newton Paper Company; G. H. Nichols & Company; Ohio Paper Company; Oliver Oil Company; Omaha & Council Bluffs Electric Railway Company; Omaha Electric Street Railway Company; Otis Iron & Steel Company; Pacific Rolling Mill Company; Pencoyd Iron Works; Pennsylvania Steel Company; Philadelphia & Reading Coal and Iron Company; Pittsburgh Locomotive & Car Work; Robert Poole & Son Company; Quaker City Dye Works; St. Charles Car Works; Sawyer-Man Electric Company; Schenectady Locomotive Works; Williams Sellers & Company; Sherman Oil & Cotton Company; Shoenberger & Company; Southern Cotton Oil Company; Claus Spreckels' Sugar Refinery; Tacoma Light & Water Company; Terre Haute Electric Street Railway Company; Union Switch & Signal Company; United Electric Light & Power Company; Vancouver Electric Street Railway & Light Company; Wellman Iron & Steel Company; Westinghouse Air Brake Company; Westinghouse Electric & Manufacturing Company; Wilmington City Electric Street Railway Company.

Over 3000 other users.

THE WESTINGHOUSE MACHINE COMPANY.
BAKEWELL & CLARKE PITTSBURGH, PENNA. U.S. OF A.

SKINNER ENGINE CO., ERIE, PA.

OVER **4500** IN USE.

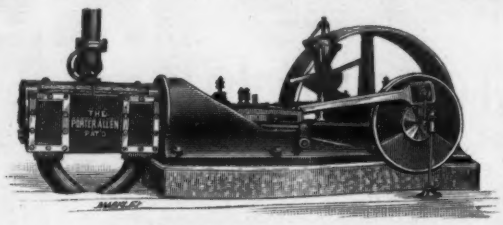
MANUFACTURERS OF

AUTOMATIC, STATIONARY & PORTABLE

ENGINES and BOILERS

SEND FOR CATALOGUE.

SOUTHWARK FOUNDRY & MACHINE CO., Philadelphia, Pa.



SOLE MAKERS OF THE

PORTER-ALLEN AUTOMATIC ENGINE.

ALSO BUILDERS OF

Blowing Engines, Reversing Engines, Hydraulic Cranes,
Centrifugal Pumps, Accumulators, Boilers Tanks, etc.

GARRY IRON AND STEEL ROOFING COMPANY,

The Largest Manufacturers of Iron and Steel Roofing in the World,

MANUFACTURERS OF ALL KINDS OF

Iron and Steel Roofing, Crimped and Corrugated Siding, Iron and Steel Tile or Shingle, Fire-Proof Doors and Shutters, Iron Ore Paint and Cement.

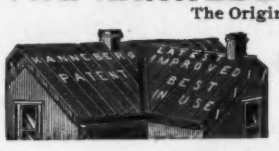
Iron Frames for Roofs and Buildings.

No. 152 MERWIN ST., CLEVELAND, O.

Send for Circular and Price List No. A

THE KANNEBERG ROOFING CO., Canton, O.

The Originators of Strictly Genuine Steel Roofing.)



MANUFACTURERS OF THE

Kanneberg Pat., Latest Improved, Folded Lock Seam Roofing.

Made of STRICTLY GENUINE STEEL.

CORRUGATED IRON (four sizes of corrugations), and Crimped Edge Iron Roofing and Siding, Beaded Iron Siding and Ceiling, Water Proof Building Paper, Dry and Ready Mixed Paints, Etc

Write for Catalogues, Price Lists and Samples.

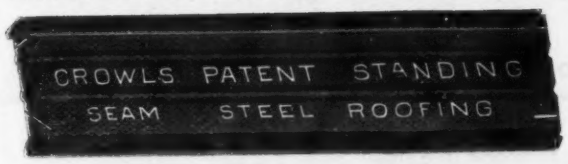
HOLTON IRON ROOFING CO.

ROOFING, SIDING, CEILING &c.

NEW LISBON O.

AGENTS WANTED EVERYWHERE

CAMBRIDGE ROOFING CO., Cambridge, O. & Chatanooga, Tenn.



Manufacturers of

Plain, Rolled, Crimped Edge, Corrugated and Beaded Roofing, Siding and Ceiling.

PURE STEEL A SPECIALTY

Send for Descriptive Catalogue.

J. H. ELLER & CO.,

—MANUFACTURERS OF—

Steel Roofing,

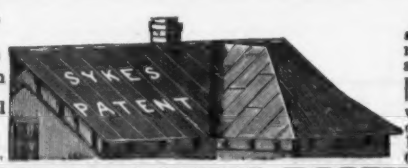
Corrugated Iron,

Crimped Edge Roofing and Siding, Beaded Siding and Ceiling, Patent Slip Joint EAVE TROUGHS, etc.

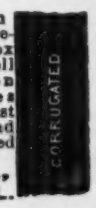
WRITE US FOR PRICES.

Agents' Wanted. Address OFFICE NO. 223, CANTON, O

SYKES' IMPROVED Best Roof in the World. Suitable for all classes of buildings. Easy put on.



All my Iron and Steel is re-rolled and box annealed, well painted on both sides with the Best of Paint and Pure Linseed Oil.



SYKES IRON & STEEL ROOFING CO.,
Send for Circular and Price List and mention this paper
NILES, O., and CHICAGO, ILL.

STEEL CASTINGS

FROM 1-4 TO 15,000 LBS. WEIGHT.

True to pattern, sound, solid, free from blow-holes and of unequaled strength.

Stronger and more durable than iron forgings in any position, or for any service whatever.

60,000 CRANK SHAFTS and 50,000 GEAR WHEELS of this steel now running prove this.

Crossheads, Rockers, Piston-Heads, etc., for Locomotives. STEEL CASTINGS of every description.

Send for circulars and prices to

Chester Steel Castings Co.,

WORKS: CHESTER, PA. OFFICE 407 LIBRARY ST., PHIADELPHIA, PA.

STILWELL'S

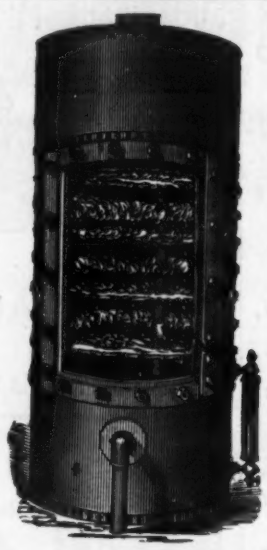
PATENT LIME-EXTRACTING

Heater and Filter

COMBINED,

Is the only lime-extracting Heater that will prevent scale in steam boilers, removing all impurities from the water before it enters the boiler. Thoroughly tested.

OVER 3,000 OF THEM IN DAILY USE.



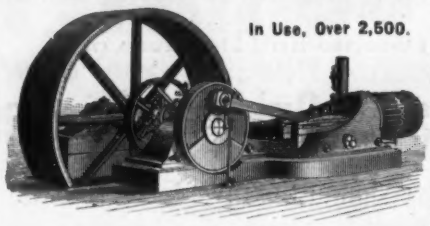
This cut is the fac simile of the appearance of the shelves o. a No. 5 Heater at work on ordinary lime-water when the door was removed after the Heater had been running two weeks.

ILLUSTRATED CATALOGUES.

Stilwell & Bierce Mfg. Co.,

DAYTON, OHIO.

NEW TANGYE BUCKEYE AUTOMATIC CUT-OFF ENGINES.



In Use, Over 2,500.

25 to 1,000 H. P.

These engines are the combined result of long experience with automatic cut-off regulation, and most careful revision of all details. They are designed and constructed for heavy and continuous duty at medium or high rotative speeds. Highest attainable Economy in Steam Consumption and Superior regulation guaranteed. **Self-contained Automatic Cut-off Engines 12 to 200 H. P. for driving Dynamo Machines a Specialty.** Illustrated Circulars, with various data as to practical Steam Engine Construction and performance, free by mail. Address **BUCKEYE ENGINE CO., Salem, O.**

SALES AGENTS:

W. L. SIMPSON, 10 Telephone Building, 18 Cortlandt St., N. Y.

W. N. ROBINSON, 154 Washington St., Chicago, Ill. ROBINSON & CARY CO., St. Paul, Minn.

Water Gas Furnaces

FOR LOCOMOTIVES, STEAMBOATS AND STATIONARY BOILERS.

A Perfect Smoke Burner.

W. S. HUTCHINSON. 6 Washington-st., Chicago.

OLD 1874. **CLEVELAND TWIST DRILL CO.,** RELIABLE 1891.

SEND FOR CATALOGUE. **Cor. Lake & Kirtland Sts., Cleveland, O.** WRITE FOR DISCOUNTS.

The Hart or Detroit

Emery Corundum Wheels and Machinery.

Write to J. WENDELL COLE, M. E.,

District Manager, Box 152, Chicago, Ill., or Box 84, Columbus, O.

☞N. B.—Also Agent for WM. SELLERS & CO.'S SPECIAL TOOL GRINDER and TWIST DRILL GRINDER WITH POINTER, for Pennsylvania, Ohio, Indiana, Illinois and Wisconsin.

PENBERTHY

AUTOMATIC INJECTOR.

Guaranteed 99 per cent. Efficiency

AS A BOILER FEEDER.

42,000 in actual use.

Sent on 30 days' trial.

PENBERTHY INJECTOR COMPANY.,

Manufacturers,

DETROIT, - MICH.

C. H. PRESLEY, Agent, Cleveland, O.

BELTING.

For general work use only Shultz Fulled Belting, but for a main driving belt take Shultz Leather Link Belt. It will give you more power and last longer than any other belt now made. We will put one in for you under full guarantee and on 60 days' trial. For sale by

THE PARKIN & BOSWORTH CO., 8 S. Water St., CLEVELAND, O.

PRESSED WROUGHT IRON OPEN TURN BUCKLES.

BEST AND Cheapest.

The list retail price of this Buckle is less than one-half the wholesale price of inferior goods when we commenced to manufacture, and dealers, even in small towns, find it profitable to carry a stock to sell with iron for tie rods

CLEVELAND CITY FORGE & IRON CO., CLEVELAND, OHIO.

REYNOLDS BROS.,

MANUFACTURERS OF

Hand Cut Files

AND RASPS.

We solicit the commercial trade only.

133 & 135 N. Water St.,

COLUMBUS, OHIO.

Old Files Recut and Warranted Superior to any Machine Cut and Lead Tempered in the market. Send for price list.

INDUSTRY FILE WORKS,

A. & H. Gough, Props.,

Manufacturers of

Files and Rasps,

Equal to the Best English File.

OLD FILES RE-CUT.

All Kinds of Job Grinding.

OFFICE & WORKS,

48 COLUMBUS ST.,

CLEVELAND, O

C. GOUGH Manager.

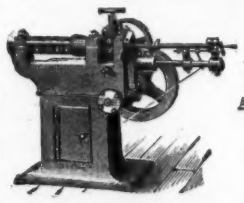
Mention this paper.

Awarded the GRAND PRIZE at the Paris Exhibition.

Cleveland Office, 412, Perry-Payne Building, Cleveland, O.

GRAHAM TWIST DRILL CO., Detroit, Mich.,

Sole manufacturers of GRAHAM'S PATENT GROOVED SHANK TWIST DRILLS and CHUCKS. Endorsed by progressive mechanics everywhere. Send for Catalogue.

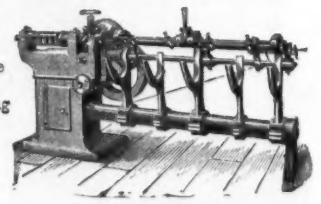


JOHN ADT & SON,

New Haven, Conn.

Builders of Machinery for Hardware Manufacture.

Automatic Wire Straightening and Cutting Machines, Butt Milling Machinery, Butt Drilling Machinery, Riveting Machines, Foot Presses, Sprue Cutters, Etc.



Enterprise Boiler Company, YOUNGSTOWN, OHIO.

MANUFACTURERS OF

BOILERS, AND TANKS, SHEET IRON AND PLATE WORK

Of all Descriptions.

Jobbers of all kinds of **Roofing Materials.**

W. H. EBERTS. ESTABLISHED 1871 J. M. EBERTS.

EBERTS BROS,

MANUFACTURERS OF

CORRUGATED IRON ROOFING, SIDING & CEILING.

OFFICE AND WORKS 192 to 198 HIGH ST. WEST

DETROIT, MICH.

PRESSED STANDING SEAM, V Crimped and Roll Cap **IRON ROOFING.**